Review of international flood insurance and recovery mechanisms:

Implications for New Zealand and the resilience of older people

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About the Author

Dr Sally Priest is a Senior Research Fellow at the Flood Hazard Research Centre, Middlesex University, London. She has over 10 years post-doctoral experience investigating the social consequences of flooding including: the effectiveness of communicating information by risk mapping, flood warning systems and their dissemination and an analysis of the strengths and weaknesses of flood management institutions ad policy regimes. Her doctoral research concentrated on institutional responses to, and financial recovery, from flooding in the UK and Australia and centred upon the role of the insurance industry. Sally has returned this area of research and has participated in the Dutch government funded Knowledge for Climate Programme investigating the potential introduction for flood insurance introduction in The Netherlands. Additionally, she is investigating the changing nature of flood insurance in the United Kingdom, in particular in relation to the introduction of a revised pool-based approach to recovery (Flood-Re).

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1 Purpose and scope

Widely available insurance within a well-functioning and solvent market has the potential to not only assist the recovery from hazard events; but also positively influence mitigation behaviour. However, the characteristics of current flood insurance models and their effectiveness vary considerably between countries. How flood insurance provision is structured, what losses are covered and excluded and how it is purchased all impact upon the effectiveness of the scheme for recovering from flood losses and ultimately how burden sharing is split between the at-risk individual and society.

This study reviews international insurance provision (and compensation schemes) for adverse natural events. It will focus primarily on flood insurance for domestic properties and in particular assess insurance cover for all sources of flooding (including fluvial, coastal and surface water) and other storm related losses. Each insurance model is described and its performance for aiding recovery as well as modifying risk behaviour examined. A number of criteria are used to evaluate these models including; degree of insurance penetration, coverage, insurability, equity, incentives for mitigation and impact on market solvency.

The review also examines the role of insurance within a broader portfolio of flood and storm management. Recognising the balance between a focus on proactive management and recovery as well as public and private investment is critical to understanding the overall role of insurance within a country and wider lessons that can be drawn. This cultural and flood management context is fundamental to assessing the impact that flood insurance may have on community resilience. Where possible, the review draws on information about insurance trends and other data for the provision of cover for older people; although the availability of data specifically for this group is limited.

The review aims to investigate the following questions:

- What is the role of insurance for adapting to flood risk and how can flood insurance arrangements be adopted to spread the burden of flooding in such a way that it builds community resilience to flooding?
- What are the characteristics of currently adopted insurance models and what are the benefits and limitations for adoption within New Zealand for building community resilience to flooding and storms?
- Is it possible to map the key criteria of insurance models and products onto the resilience characteristics and needs of older people?
- What insurance products and assistance are best placed to assist older people to secure their quality of life, given the risks of hard to predict, severe adverse events impacting on their community?
- What specific needs do older people in New Zealand have with regard to the provision of flood insurance? For instance, issues of accommodation security, tenure and the problematic insurance status of retirement village residents. Are innovative models of insurance required and is the insurance industry able to provide these?
- What is the current interest of insurers in promoting mitigation and community resilience? What activities have they undertaken and how interested are they in features such as resilient design and the structural integrity of dwellings.

2 Building financial resilience to flood losses: Introduction to the general principles of insurance, the insurability of floods and the role of compensation

There are many ways in which those who suffer the impacts of flooding can financially recover from the losses. These mechanisms can be broadly characterised by the level to which those who receive financial assistance, directly pay for the recovery mechanism and the formality and rigidity of the device. It has been stated that;

"In recovery terms there are two issues; efficiency which involves the design of loss-sharing agreements that provide incentives for mitigation; and equity which is how to evaluate the fairness of loss-sharing arrangements that reduce the vulnerability of different groups."

IIASA (1999, p3).

Recovery systems have to therefore balance these two objectives. Priest (2003) provides a straightforward typology of flood-recovery options with the directness of financial input by the individual affected diminishing progressively as you read down the table.

It is often the case that following a flood event (and in particular one that causes extensive damages) a variety of these different mechanisms is in place or adopted to recover from flood impacts. It is likely that victims will be offered some assistance and will be expected to bear the remainder of the losses themselves. The most common mixes are those between the levels of flood victims bearing the loss individually and between compensation and flood insurance. Indeed, even those individuals with the most comprehensive flood insurance policies usually have to bear some of the loss through the application of a deductible.

Examination of the recovery mechanisms used internationally (Section 6) highlights the various blends of these devices, illustrating the situations under which they operate. Each will be critically assessed using the two key characteristics described by IIASA (1999): efficiency and equity. These assessment criteria are discussed in more detail in Section 4. To this is added the third criteria of robustness; as a recovery mechanism will be unable to achieve its goal in the longer term if it is not economically viable. This is particularly important in the case of flood insurance provision and there are several principles to which insurance needs to adhere to be considered equitable, efficient and robust.

Table 2.1: Types of recovery from flood losses

Recovery mechanism	Explanation and characteristics
Loss bearing	The victim carries all of the losses. This might mean drawing on savings or having to borrow money in order to re-build and recover from flood damages. In this case the victim is generally directly paying for all of the losses; although also within this category passing the loss onto the immediate family may also be described.
Loss sharing	This involves spreading the flood losses more widely and there may be many ways in which this is achieved; a formalised mechanism is **flood insurance**. Those recovering from losses are directly paying for these damages through the premiums, however the losses are spread temporally and spatially and therefore they do not pay the total amount.
Compensation	Compensation can be described as a more social device and is a term that is used to describe the situation where the national, regional, city, or local government provide assistance following flooding. The victim does pay for a percentage of the damages in the form of taxes although the payment is very indirect and not directly related to the value of their property of the losses that they suffer.
Charitable/ International aid	Assistance from outside of the community and even from outside of the country. The money from these organisations usually comes from donations and therefore the victim does not directly pay for the losses.

Source: After Priest (2003)

2.1 General principles of insurance and insurance for natural hazards

This section briefly introduces the basic principles of insurance (see also the Glossary in Appendix C) and the conditions which need to be met in order for an insurance scheme to be viable. It concentrates on property and contents insurance; personal and health insurance will not be covered. Faure and Hartlief (2003) discuss the basic premise of insurance as being relatively straightforward – it is a mechanism in response to risk aversion. Individuals, companies and countries need to have an aversion to risk and to the uncertainty about that risk before they will seek coverage. Much has been written about the conditions necessary for risks to be insurable and for insurance schemes to be robust. Arnell (2000) presents five conditions that need to exist to ensure the sustainability and long-term robustness of any insurance strategy. These are:

1. It must be possible to estimate the **likelihood and magnitude of possible losses**, so that premiums can be calculated that reflect this loss potential. If this is not possible, the premiums become arbitrary and the insurance agency (private or governmental) is at risk;
2. Losses from individual claims must be **independent**, and no single event such as a major flood should affect the majority (or even a large number) of those insured. If this is not the case, then the insurance agency might be faced with an overwhelming claims total, and fail.
3. The occurrence of any event leading to claims **must not be predictable** in deterministic terms (i.e. the dam will fail tomorrow and my house will be lost), or else those purchasing policies will only do so when they know that a claim is certain / likely.
4. There must be sufficient **demand** for insurance coverage to make a large enough market whereby a single event such as major flood does not lead to claims that exhaust the insurance agencies' resources.
5. The **premium** charged to the insured must be acceptable such that coverage is purchased.

Source: Arnell (2000; 413).

In a similar manner, Hausmann (1998) and Mehlhorn and Hausmann (2012) introduce six different "Principles of Insurability" some of which map onto the conditions presented by Arnell (2000) above and others which complement them. Table 2.2 combines these principles and these characteristics will be used in Section 2.2 to discuss the particular challenges associated with the insurability of flood insurance.

Table 2.2: Principles of Insurability (After Mehlhorn and Hausmann, 2012[1]; Hausmann, 1998 and Arnell, 2000)

Principle	Description
Mutuality	"A large number of people who are at risk must combine to form a risk community". This relates to Arnell's principle that there is a sufficient demand for insurance.
Assessibility	"The expected loss burden must be assessable." This means that it needs to be possible to estimate both the likelihood and magnitude of possible losses so that premiums can be calculated to reflect this loss potential.
Randomness	"The time at which the insured event occurs must not be predictable, and the occurrence itself must be independent of the will of the insured." This is similar to the independent and unpredictable characteristics (Points 2 and 3) described by Arnell (2000).
Economic viability	"The community organized by the insured people must be able to cover its future, loss-related financial needs on a planned basis."
Similarity of threat	"The insured community must be exposed to the same threat, and the occurrence of the anticipated event must rise to the need for funds in the same way for all concerned."
Need	"When the anticipated event occurs, it must place the insured in a position of financial need."
Affordability	This final point relates to the need to ensure that insurance is affordable and that the premium is acceptable to the majority. Without this criterion being fulfilled the mutuality element of insurance will not be sufficiently fulfilled.

[1]Presented in Hausmann (1998) which gives the original source as Gruss, W. (1977) Versicherungswirtschaft. Verlag Peter Land: Bern, Switzerland. The 2012 Principles omits Need, but assumes that the majority of floods will cause damages and create a financial need. NB – the first five principles are those reported by Mehlhorn and Hausmann (2012) and their original principles are quoted in italics

Michel-Kerjan (2001) highlights that one of the main characteristics of natural perils is the movement from a situation of private risk towards one of collective (or societal) risk and adverse natural events are not always subject to the same traditional rules of insurance. He goes on to argue that single property risks, when combined through a natural catastrophe aggregate, become a public problem which is potentially greater than the collection of the individual risks. Therefore, effective insurance against these risks is essential to the resilience of any natural disaster-prone community.

Private and public-based insurance has long played a role in the recover from natural hazards. White (2011) suggests that insurance is "a key pillar in any comprehensive strategy of adaptation to natural hazards" Insurance:

- increases resilience against residual risks that cannot be prevented or mitigated
- can incentivize engagement and investment in risk mitigation measures
- reduces pressure on the fiscal budget from natural disasters

After White (2011).

Hoeppe and Gurenko (2006) argue that in developed countries the insurance industry absorbs approximately 40% of all economic losses caused by adverse natural events. From the perspective of private insurers, if the market is functioning well, natural risks are assessable and if there is a sufficient demand for coverage, insurance against natural perils have the potentially to be profitable. Governments are also keen to have a functioning insurance system due to the potential demands on public resources following large natural events. For instance, following a disaster governments are often expected to provide to support for reconstruction which may also extend to assistance to the individual households if insurance is not available or widely adopted. Different types of insurance (whether private or public), reinsurance and also the creation of *ex-ante* compensation funds permit governments the ability to reduce the pressure on fiscal budgets following disasters and spread that risk over both time and space.

Insurance therefore is a "potentially valuable tool for encouraging loss reduction measures against natural hazards and for providing recovery funds to disaster victims" (Kunreuther, 1996; 184). However, he goes on to argue that the types of exposure being covered and the nature of adverse natural events means that private insurers are not able to take on these risks alone and that they are reliant on other mechanisms to assist in risk management. Consequently, there is often the need to require the active involvement and agreement of other parties such as government agencies, building contractors and other financial institutions to ensure that other policy tools (e.g. construction codes, risk reduction measures) are implemented (Kunreuther, 1996).

The following section explores the nature and characteristics of flooding and the insurability of losses from flood events.

2.2 Insurance as a mechanism for recover y from flood events: Key characteristics of the insurability of floods

Sayers et al. (2012; 187) identify four main roles of flood insurance when it is part of a portfolio of measures to reduce, manage or recover from flood risk:

1. **Reimbursing** those who suffer damage, and thereby restoring them to their pre-flood financial situation.
2. **Spreading** the costs of flooding across communities (and clients), given that floods may affect only some communities at a time; and for individuals through time by spreading the potential costs of flood damage over many years in relatively small payments rather than having a single large cost if, and when, a flood actually occurs.
3. **Reducing** the costs to the government of post-event recovery since the insured will receive insurance funds (note: where a private insurance sector exists only)
4. Promoting **a change of behaviour** with regard to exposure to flood risk, by giving a signal of the hazard that people face and providing incentives for "good behaviour"

Purchasing insurance ensures that a certain level of financial recompense is granted after a flood event and it can therefore be described as acting as a buffer between the impacts of a hazard and those who may be affected. In essence, flood insurance might be considered to be an economically-structured social device. Fundamentally, flood insurance can be viewed as a risk transfer

mechanism through which the adverse impacts of flooding are transferred through both time and space. An individual takes out insurance to reduce the uncertainty of recovery from flood impacts in the future. By paying a premium in the short term they are ensuring that they will receive recompense in the event of future flooding. The flood risk is also transferred spatially because, through multiple premiums, an insurance company can pool the risk over a wider geographic area. This means that the total risk of flooding is reduced to a manageable level and their insurance portfolio remains 'viable'. In order for flood insurance to be offered and the market to remain sustainable there are a number of criteria which need to be fulfilled. These criteria are collectively known as the insurability of the risk.

Therefore, in principle insurance appears to be an appropriate and successful way in which individuals, communities and governments might enable the recovery from flood damages. However, Mehlhorn and Hausmann (2012) suggest that providing insurance for flood events provides a very specific set of challenges which unless handled carefully can prevent its commercial viability. Each of the principles identified above in Section 2.1 are re-presented in Table 2.3 in relation to their significance with the provision of flood insurance (after Sandink et al., 2010). This highlights that some of the principles are easier to establish than others and also illustrates the clear interaction between the principles. For instance, unless the assessibility of the risk is adequate this threatens the economic viability of the scheme; whereas not ensuring randomness within the risks covered threatens the mutuality of the insurance.

Table 2.3: Application of the general principles of insurance to floods: the insurability of flooding

Principle	Description
Mutuality	While traditional flood definitions do not lend themselves to mutuality (i.e. those occupying floodplains), when a more encompassing definition of flood is used, which includes flooding that can occur virtually anywhere, mutuality can be obtained. Mutuality is then addressed through bundled insurance coverage for flood.
Assessibility	Assessibility can be attained through renewed and continued flood mapping efforts. However, there needs to be a balance between very accurate assessment and knowing too much about the risk. In many situations accurate assessment is a barrier to accurate pricing; although this is improving all the time.
Randomness	Sandink et al. (2010) suggests that randomness might be achieved by restricting insurance from those at highest risk (e.g., those who occupy the 1 in 100 year floodplain), and through insurers keeping track of changes in flood hazards. However, depending on the location in question and the terms of the cover this might threaten the mutuality (and thereby the economic viability) of the insurance scheme as it may lead to an insufficiently large pooling of the risk.
Economic viability	A robust and large insurance community can result in economic viability through bundled flood insurance coverage. A large insurance community can serve to keep insurance rates low, and will provide capacity for pay-outs when flood disasters occur.
Similarity of threat	Water is the cause of damage in each case regardless of the type of flooding that occurs. This is not the same of course if flood insurance is bundled with other types of perils and the threat (although in some cases can still be linked) can be dissimilar.
Need	There exists a need to cover flood damages – i.e. flooding will cause individuals or companies to suffer material damages and be in financial need of recompense. This is a usual situation in relation to flooding.
Affordability	This final point relates to the need to ensure that insurance is affordable and that the premium is acceptable to the majority. Without this criterion being fulfilled the mutuality element of insurance will not be sufficiently fulfilled.

Source: After Mehlhorn and Hausmann (2012), Sandink et al. (2010)

Of initial interest when discussing flood insurance is what is defined as flooding from an insurance perspective; as this ultimately determines those impacts that are ultimately compensated. Flood definitions of course vary between policies, between insurers and between those countries in which flood insurance is provided. What is surprising however is although definitions of flooding are often considered to be precise they are equally often confusing in terms of coverage; often resulting in court challenge. An example of this is in Australia, where riverine flood insurance has traditionally been limited, yet the poor and confusing working of insurance cover from storms means that many homeowners still believe that they are covered when affected by a flood. A similar issue occurred in the US following Hurricane Katrina leading to lengthy lawsuits costing US$ millions. In this case insurers argued that homes were washed away by storm surge (an in effect flooding) and therefore claims were only valid for those fewer eligible properties participating in the National Flood Insurance Program. Conversely, homeowners argued that their properties were taken away by the wind and therefore they should receive full indemnification for the losses from insurers (Sandink et al., 2010). Therefore the definition of insurance is critical and not always straightforward. A similar problem exists in New Zealand between damages caused by flooding (covered by private insurance) and debris flows (covered under the EQC) which highlights the importance of how an event is defined (discussed in more detail in Section 5).

Much confusion also exists in New Zealand in relation to the terms of insurance and if or how their policy covers flooding. In many cases the extent of coverage is ambiguous with insurers in particular not being clear about if the insured amounts include or exclude Goods and Services Tax (GST) leaving the insurant unclear about how much they will receive from the claims process.

Mehlhorn and Hausmann (2012) present the three major obstacles to the provision of flood insurance. These barriers are:

- The assessibility of the losses
- The problem of anti-selection;
- Ensuring economic viability of the insurance system

It is possible to overcome these barriers through a well-functioning system and these barriers and their potential solutions will now be discussed.

2.2.1 Assessibility of losses

This first barrier identified by Mehlhorn and Hausmann (2012) is that the risk is assessable. In order to ensure that an insurance company remains in business it is essential that they have a good strategy to manage their risk exposure. Indeed, this exposure management is seen as critical to good insurance practice and is becoming increasingly regulated by such instruments as the EU Directive Solvency II (European Parliament and of the Council, 2009 – see Appendix A1.1). To enable the exposure to be effectively managed the flood hazard and risk needs to be translated into damages and monetary values in order that adequate premiums are established. This thus introduces reliance upon adequate identification of the hazards and requires the availability of either past historical records, floodplain mapping or inundation modelling. If this data is not available or easily accessible then this may lead to the inability to provide effective cover for this risk.

However, the reliance on data and flood modelling may vary depending upon how flood insurance is provided and how the cover is structured. The more directly the premiums need to relate to the risk (i.e. through a single insurance policy for flooding) the more important the assessibility of that risk is. The importance of flood data diminishes when dealing with a composite package and it is the balance between the different types of risks that emerges as being of greater significance. Insurers would argue however that the more information that they have about flood risks the better: even if they choose not to use all of this information for pricing purposes.

It is not only the accessibility of the risk which impacts on the premiums charged; in many instances the market also intervenes. This is noticeable in the United Kingdom, for instance, where for many years the general insurance market has been very competitive and therefore it has not be economically viable to price flood insurance in direct relation to the risk.

Although there have been moves towards better assessibility of flood risks it is still important to retain some element of uncertainty; if a loss is expected to occur then a pay-out is likely. Insuring

a risk that is considered to be 'certain in timing' goes against the general principles of insurance as it removes the ability of the insurer and reinsurer to accrue profit. This starts to become an issue in areas of very high flood risk and those that suffer repeated events where although the exact timing of a flood is still uncertain; the high probability of an event may lead to conditions of uninsurability unless other mitigation measures are implemented.

Connected to the issue of risk assessment is moral hazard (Winter, 1992). This is related to the potential increase in the "probability and/or size of loss caused by the behaviour of the policyholder" (Kunreuther, 2002). It has been acknowledged that the presence of insurance provision may have a detrimental effect upon the actions of property owners in reducing the impacts of flooding. Insurance companies need to be able to estimate the impact of this behaviour; otherwise it is likely that insurance premiums will be too low.

2.2.2 The problem of anti-selection

"A fundamental principle of insurance is that it groups individual risks into 'pools' of similar risks. This helps to ensure that everyone pays a fair price for the risk that they bring into the pool" (Sampson, 2001). Therefore, there must be sufficient demand for coverage of flood insurance in order to establish a large enough pool of policyholders. This ensures that any one insurer has enough income spread over a wide region so that not all policyholders will claim if a major event were to occur and therefore the risk is transferred spatially.

However, many adverse natural events are considered to be a correlated risk where many properties in the same area suffer losses as part of a single event (Kunreuther, 2007). This is the situation with flooding, the characteristics of this hazard means that often large geographical areas are inundated at the same time, thereby exposing insurers to large losses. Similarly, it is often the same areas that are repeatedly affected. In this respect, the hazard of flooding hinders insurers from following the fundamental principle of insurance in spreading the losses over both time and space. Theoretically, if flood insurance was to be presented as a single risk, and a separate premium offered, there is the likelihood that only those who believed that they might be flooded would purchase it. The problem with this is two-fold. Firstly, if only those liable to flooding bought cover, then the risk is not sufficiently spread spatially and the insurance companies are unlikely to be able to generate a sufficient pool from which to draw in the event of widespread flooding. "The mutuality requirement of flooding is not met when frequently affected risks are the only ones insured," (Hausmann, 1998, p7) and therefore the economic viability of the insurance system is threatened. This is a situation present with the US National Flood Insurance Program leading to the need to reform as occurred in 2012 (Anderson, 2000; Burby, 2001). Secondly, if the pool is not large enough to spread the risks, the costs of insurance for those purchasing it is too high (Paklina, 2003).

This situation where only those affected by a peril wish to purchase insurance is known as adverse-risk selection or 'anti-selection'. Generally, anti-selection only occurs in those situations where flood insurance is optional (Crichton, 2008; Sandink et al., 2010). If insurers were to offer cover purely for flood insurance, they may find that they are liable to pay out very high numbers of claims, without having the premium base to cover it. A first approach to overcoming this problem is to charge technically-priced premiums which directly reflect the level of the risk faced. Many policyholders would deem these to be unacceptably high and unaffordable; thereby one of conditions suggested by Arnell (2000) that the size of the premium is acceptable to the insured is not fulfilled. To be able to secure a wide coverage and a sufficient number of policyholders, it is essential that the premiums are set appropriately and are considered to be acceptable to the insured. This raises implications concerning the image of insurance companies and concerns by insurers over the adverse publicity associated with increases in premiums.

The main mechanism that many private insurer's use to tackle the problem of anti-selection and the problem of not being able to charge full-actuarial premiums, is to pool the risks further and charge premiums that are not commensurable solely with the flood risk. Composite insurance involves the bundling' of flood insurance with other perils and these often include other natural perils (such as earthquakes, windstorms) and fire or theft policies. In these cases those not liable to flooding, but still susceptible to the other bundled perils, such as fire and theft, would essentially be cross-subsidising those flooded during a major event.

A related issue is whether an insurance policy is voluntary or compulsory in nature. The type of the insurance therefore impacts upon the number of policyholders purchasing flood insurance and ultimately the size of the pool. If insurance is voluntary then this also leads to issues about awareness of the hazard and ultimately whether they would purchase flood insurance to assist recovery following a flood event.

2.2.3 Ensuring economic viability of the insurance system

The final obstacle of Mehlhorn and Hausmann (2012) relates to the insurance company (or state entity in the case of governmental-backed insurance) maintaining its economic viability. Sandink et al. (2010; 41) affirms that economic viability is threatened "when extremely large loss events affect an area with a large concentration of policy holders". Botzen and van den Bergh (2008) argue that this may occur when risks are highly correlated which may be the case with natural events (e.g. storms and flooding). Therefore, the losses actually incurred by the insurance company need to be relatively low compared to the total number of premiums sold. This is to ensure that the insurers have enough in their 'pool' to cover their loss. There needs to be a balance struck by those managing the risk. The level of premium needs to ensure that the price is acceptable to those being insured, so that enough people take out cover to spread sufficiently the risk geographically. Furthermore, a sufficiently high premium needs to be charged so that a private insurance company both covers its losses in the event of a pay-out, and has sufficient funds to invest to make a profit. It is this aspect that may be challenging the insurance industry's willingness to continue providing cover, as the profitability of general household insurance is threatened. Flooding may affect the economic viability of insurance in two specific ways: as flooding may occur in a small geographical area if insurers have too much exposure in that location and secondly if flooding affects widespread areas of a country (e.g. Elbe 2002, summer 2007 in UK and Queensland 2010/2011).

In the strictest sense those offering insurance via a commercial market are in business to make a profit, a fact that needs to be remembered whenever the private insurance industry is being considered. This is a relatively complex notion. Profits will be generated if the income gathered through premiums exceeds the amount paid out as claims and the money spent on administrative overheads. This is not the whole situation, as even if insurance companies are unable to make a profit directly from a particular insurance product such as flood insurance (i.e. claims exceed premium income), their business might still be profitable. This profit could be generated solely through the investment of the premiums that have been collected (D. Whitaker; Guy Carpenter, pers. comm.) or through an insurers' diversification of insurance products.

As well as making a profit it is equally essential for the insurance company to remain solvent, as it is not just the company who would suffer if they were unable to make payments after an event. The collapse of an insurer, similar to that of Independent in June 2001 (BBC news website, 2001) threatens policyholders' compensation and it may also mean that the obligations of the insurer to provide recovery would fall on another party, either the rest of the industry or the Government (Dlugolecki, 1999). It is essential that insurers have a good idea of the risks involved when offering cover and have a proficient risk management strategy aimed at calculating and understanding their aggregate exposure.

Although there are a number of issues related to the insurability of the flood peril there are various ways in which flood insurance and reinsurance can be delivered and maintain these principles (Mehlhorn and Hausmann, 2012). These are explored further in Section 6 and Appendix A.

As discussed above, bundling risks is the main way that insurers use to increase the pool of insured and spread the risks geographically. Sandink et al. (2010) also stress the importance of reinsurance in reducing the risks to insurers and guaranteeing the limiting of their financial exposure.

2.3 The context of insurance within disaster-risk financing

It is important to briefly put catastrophe risk insurance for properties into a broader context of disaster-risk financing. Many provide categorisations of different types of disaster

Table 2.4: Pillars of disaster risk financing and insurance

Type	Description	Primary beneficiaries
Sovereign Disaster Risk Financing	Financial strategies to increase the financial response capacity of governments in the aftermath of natural disasters, while protecting their long-term fiscal balances	National and local governments
Property Catastrophe Risk Insurance	Develop competitive and sustainable catastrophe insurance markets and increase property catastrophe insurance penetration	Households, small-and medium-enterprises; national governments
Agricultural Insurance	Develop cost-effective, sustainable and affordable agricultural insurance programs for farmers, herders, and agricultural financing institutions	Farmers, herders, rural finance institutions, cooperatives
Disaster Micro-Insurance	Facilitate access to disaster insurance products to protect the livelihood of the poor against natural disasters and promote disaster risk reduction in conjunction with social programs	Low-income populations

Source: After GFDRR (2011a)

financing and insurance (e.g. GFDRR, 2011a; Schrader, 2012). GFDRR (2011a) identifies four different categories which are presented and explained in Table 2.4. The comparison in this report focuses almost exclusively on the first two of these categories: Sovereign disaster risk financing and property catastrophe risk insurance. Although this report primarily provides a comparison of insurance and compensation schemes for individual citizen's property, other types of financing from disasters are used and some are becoming more important in certain situations.

One of the most desirable situations is to transfer the financial losses and risks to the market as this is often seen to be the most effective and efficient mechanism for dealing with them. The UN/World Bank (2010) has identified three different ways in which financial risks can be transferred to the market and the instruments that are used to make the transfer. They also identify two ways in which the financial risk is retained (Figure 2.1).

2.3.1 Insurance versus compensation

The mechanisms that communities and individuals use to recover from flood loss vary greatly between countries. In some, particularly in the developing world, there is little formal assistance following flood events and the majority of the loss falls upon individuals and communities (risk-bearing). International and charitable aid is offered for the more catastrophic events, however for the smaller more frequent events the community has to bear most of the losses (Blaikie et al., 1994; May et al., 1997). On a global scale IIASA (1999, p3) believe that "victims and their governments bear the major losses from natural disasters worldwide and that there is only moderate risk transfer with insurance and even less global loss sharing through international aid." There is much that can be learned from studying the situation in these countries and the ways in which these communities cope with the impacts of flooding is important.

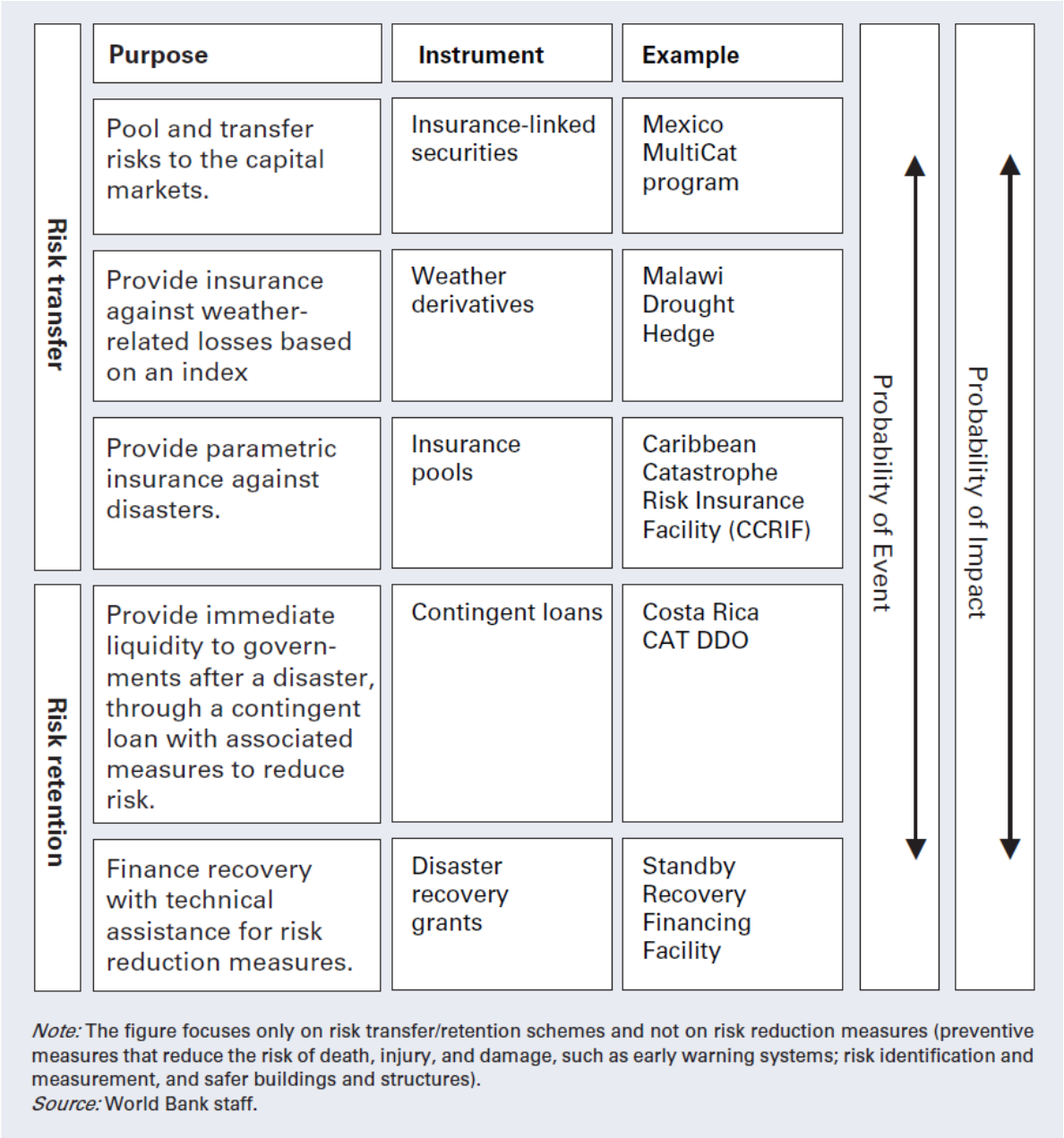
It is important to realise that when discussing mechanisms for recovery from flood loss in developed countries (i.e. those nations where international aid is not required following a disaster), society ultimately bears the loss. It is the mechanism and route by which the finances are distributed that differs. In the case of compensation and government assistance following flooding, society contributes through taxes. If a commercial market provides insurance then members of society provide these payments through premiums. Society is fundamentally investing in the recovery of productive capacity following a flooding event.

The role of society in ultimately paying for these losses is often masked by the mechanisms used to hold and distribute funds following a flood event. This relationship needs to be remembered and made more explicit, in order to highlight and educate the public about the role that they are playing in paying for flooding events and therefore the steps that are possible for society to take to reduce these costs.

What is of primary concern is the balance between different levels of individual loss bearing and more

structured mechanisms designed to provide economic recompense. It is also important to examine the insurance penetration of each of the different schemes and judge whether perception of the level of compensation on offer, directly or indirectly, affects the purchasing of flood insurance.

Figure 2.1: Managing and transferring financial risks to the market



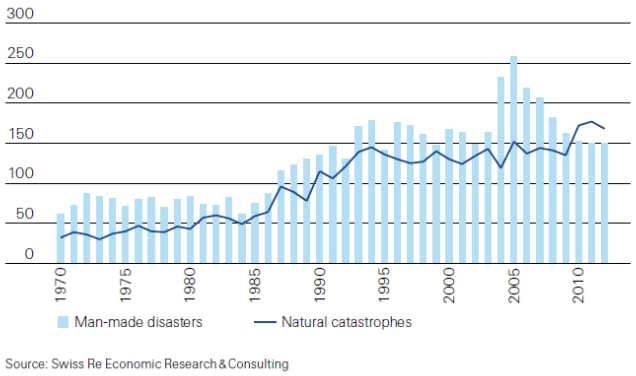
Note: The figure focuses only on risk transfer/retention schemes and not on risk reduction measures (preventive measures that reduce the risk of death, injury, and damage, such as early warning systems; risk identification and measurement, and safer buildings and structures).
Source: World Bank staff.

Source: UN/World Bank (2010, p149).

3 Trends in flood losses: the importance of flood insurance

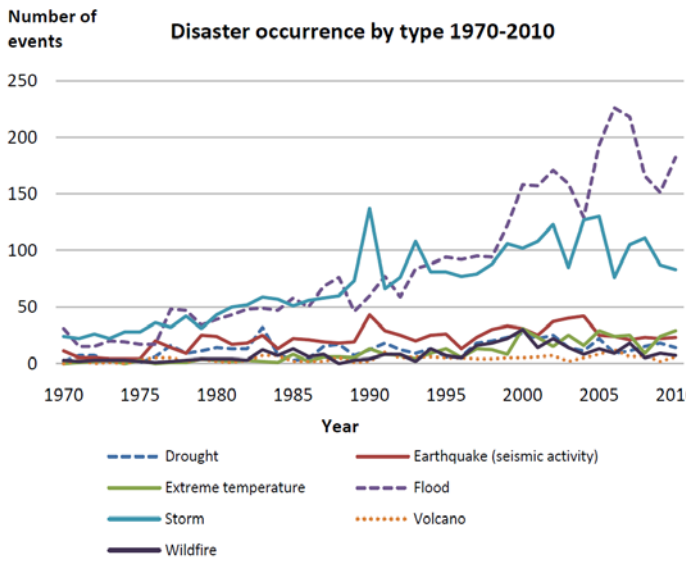
Much has been written about the growing trends in losses due to natural hazards; both in terms of fatalities and economic damages (Barredo, 2009; Kunreuther and Michel-Kerjan, 2012; Bevere et al., 2012; Bevere et al., 2013; Kundzewicz et al., 2013). This section will provide a brief discussion about the nature of flood losses in comparison to other natural hazard events and the significance of insured losses.

Figure 3.1: Number of events between 1970 and 2012



Source: (Bevere et al., 2013)

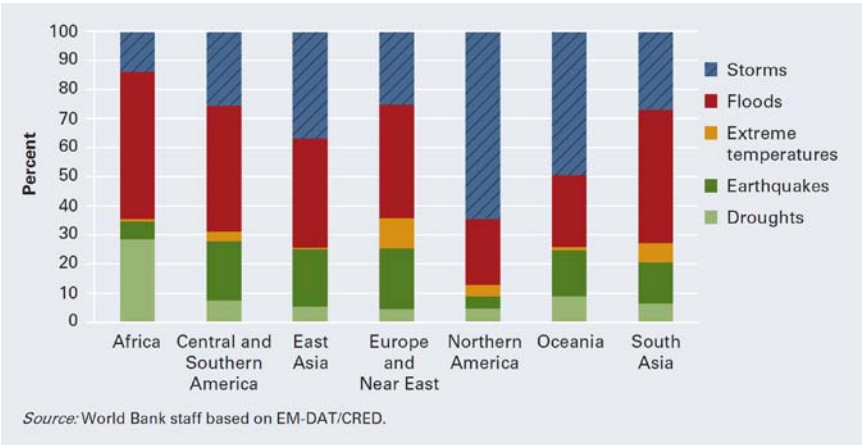
Figure 3.2: Graph illustrating the number of disasters by type between 1970 and 2010



Source: GFDRR (2011a)

Figure 3.1 highlights the upward trend in the number of events considered to be disasters (both natural and man-made) between 1970 and 2012. Figure 3.2 disaggregates this trend based upon the type of natural event. Of interest for this study is the upward trend in the number of flood events which in 2010 numbered over eight times as many as in the early 1970s. The IBRD (2010) represents similar data but highlights the significance of different types of natural hazards within different regions (Figure 3.3). Floods dominate in all but North America and Oceania where storms are the most frequent disaster; with floods ranking as second. Of course with better reporting, wider access to data and an increasing interest in natural disasters, it is difficult to discuss the numbers absolutely; despite this however there is some evidence to suggest that both floods and storms are becoming more frequent.

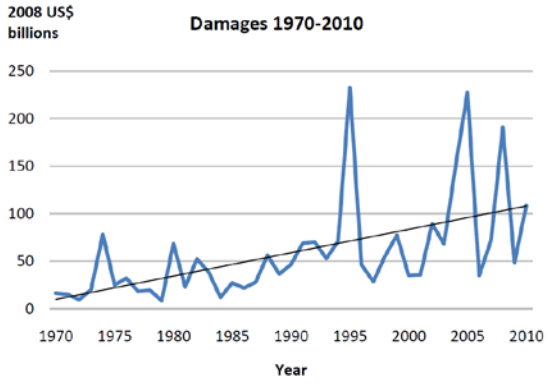
Figure 3.3: Frequency of different types of disasters between regions



Source: International Bank for Reconstruction and Development (2010; 28).

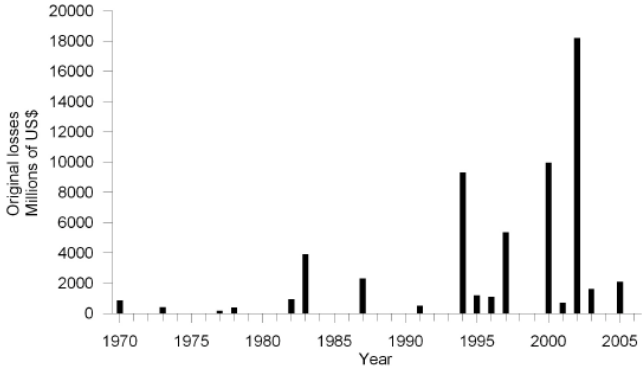
The GFDRR (2011a) also present another graph (Figure 3.4) which highlights the upward trend in damages from disasters over the same period. However, although the absolute values of disasters do appear to be increasing, there is a question about whether losses are actually increasing through the higher numbers of events or if increasing losses are more linked to changes in socio-economics (e.g. through inflation, population changes and increasing wealth per capita). Barredo (2009) undertook a study on a small sample of disastrous floods (defined as those with losses greater than US$1000 million at 2006 values; NZ$1236 million) and normalised the damages to 2006. The results of this study (Figure 3.5) highlight that this upward trend in damages is no longer visible in the loss data and that a more periodic nature of damage loss is observed.

Figure 3.4: The upward trend in disaster losses between 1970 and 2010

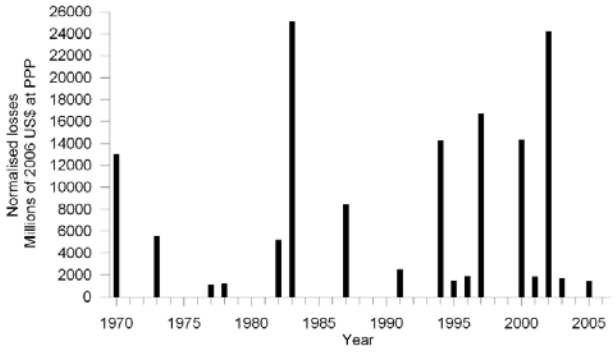


Source: GFDRR (2011a).

Figure 3.5: The effect of normalising damages on major flood events in Europe (1970 to 2005)



Annual flood losses in Europe (for the 'major' flood events)



Annual flood losses in Europe with normalised damage values to 2006

Source: Barredo (2009; 101)

Bevere et al. (2013) highlights that floods were the most significant natural peril in terms of the frequency of events in 2012, however when the value of insured losses are considered, it comes very low down the list of hazards. This may be for one of two reasons; either few losses are insured for floods or other types of natural events cause more damage. The latter of these is more likely as when the twenty most costly events for insurance loss in the list are examined, only two flood events appear (the UK floods in June and November 2012) ranking only 13th and 14th on the list. There is some ambiguity in the data as topping the list of the most costly event (at US$ 35 billion in insured losses more than three times the next most costly event) is Hurricane Sandy which has been categorised as a storm event; however many of the losses were in effect caused by flood-related damages. Hurricane Sandy was considered to be an extreme event hitting areas with high loss potential, therefore it is important to question whether the insured losses in 2012 are indicative of the normal pattern in other years, or if there is indeed a recognisable pattern. Table 3.1 highlights not only the variability of insured flood losses from year to year but also the percentage contribution of flood losses to total insured losses. This ranges from a low of 0.8% in 2004 to a high of 24% in 2007.

Table 3.1: Major annual losses by loss category[2] (2004 to 2012)

Year		Categories of natural disasters							Total – all natural disasters**
		Floods*	Storms	Earthquakes tsunamis	Droughts, bush fires, heat waves	Cold, frost	Hail	Other natural catastrophes	
2004	Frequency	37	48	13	1	11	5	1	116 (34.9%)
	Insured losses (in US$ million)	361 (0.8%)	38 175	5 657	2	1 030	551	-	45 737 (94.1%)
2005	Frequency	61	48	12	10	12	3	3	149 (37.5%)
	Insured losses (in US$ million)	3 464 (4.4%)	73 512	234	20	623	477	-	78 330 (93.9%)
2006	Frequency	58	47	9	5	12	5	-	136 (39.0%)
	Insured losses (in US$ million)	984 (8.3%)	8 265	81	120	1 360	1 028	-	11 838 (74.5%
2007	Frequency	53	57	10	7	10	3	2	142 (42.4%)
	Insured losses (in US$ million)	5 798 (24.7%)	6729	788	745	487	7	76	23 269 (84.4%)
2008	Frequency	44	62	12	2	7	7	3	137 (44.1%)
	Insured losses (in US$ million)	2 059 (4.6%)	39 288	422	500	1 575	763	85	44 692 (85.15)
2009	Frequency	46	51	13	8	6	8	1	133 (46.2%)
	Insured losses (in US$ million)	1 667 (7.5%)	13 548	609	1 748	586	4 197	-	22 355 (85.1%)
2010	Frequency	69	63	13	9	10	1	2	167 (54.9%)
	Insured losses (in US$ million)	6 393 (16.0%)	20 126	12 943	10	397	-	-	39 869 (91.7%)
2011	Frequency	65	76	15	9	8	2	-	175 (53.8%)
	Insured losses (in US$ million)	16 282 (14.8%)	41 152	49 194	2 431	250	630	-	110 021 (95.0%)
2012	Frequency	63	61	15	8	13	5	3	168 (52.8%)
	Insured losses (in US$ million)	2 712 (3.8%)	54 065	1 787	11 524	250	900	-	71 278 (92.3%)

Source (Data from Zanetti et al., 2004; Zanetti et al., 2005; Zanetti et al., 2006; Zanetti et al., 2007; Enz et al., 2008; Enz et al., 2009; Rogers et al., 2010; Bevere et al., 2011; Bevere et al., 2012; Bevere et al., 2013)

[2]NB * The percentage value given here in the floods is the total insured flood losses as a percentage of total natural hazard losses for that year. ** insured losses are provided for a range of different categories (e.g. man-made disasters, aviation disasters, mining disasters, terrorism etc.) therefore the percentages presented in this column are the values out of the total number of disasters.

Paklina (2003) in her study following the 2002 European floods highlighted the considerable flood-related losses that some insurers suffered. Table 3.2 provides the scale of these losses for some of the larger insurers and it is important to realise that the data provided here are not the total claims but the *losses* suffered by the companies (i.e. total claims minus flood-related premiums). Although the total flood-related losses in 2002 were considerable across the board they were not considered to have threatened the viability of the insurance industry: however following the floods the cost of insurance was considered to be increasing (Paklina, 2003).

Table 3.2: Estimated losses of (re)insurance companies from the 2002 floods

Company	Estimated gross losses in million Euro
Munich Re	217 to 500
Swiss Re	170 to 250
Partner Re	100 to 120
Hannover Re	64 to 150
General & Cologne Re	50
Allianz	770
Assicurazioni Generali SpA	79
Pojistovna Ceske Sporitelny (CZ)	69 to 260
Converium	36 to 50
Gema	150
Axa	75
AGF	58

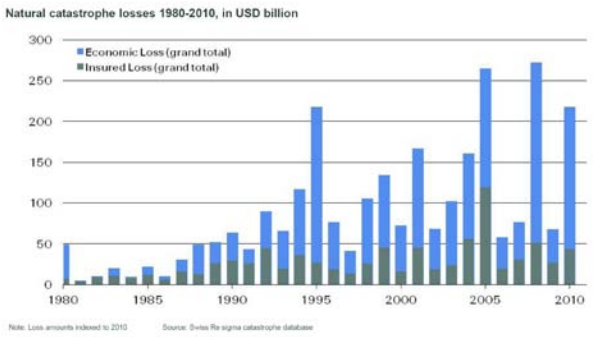
Source: (after Paklina, 2003; 4).

Melhorn and Hausmann (2012) contend that insured losses are only small in comparison to all flood losses. Bernhardt (2011) highlights this gap between the insured losses from catastrophic events and total economic losses (Figure 3.6)

3.1 Flood losses in New Zealand

The Insurance Council in New Zealand publish data about the costs of natural disasters in New Zealand primarily focussing on the significant events[3]. No-one can question the significance of the 2010/2011 Canterbury earthquake series in terms of their impact on the insurance industry with insured losses of over NZ$10 billion being

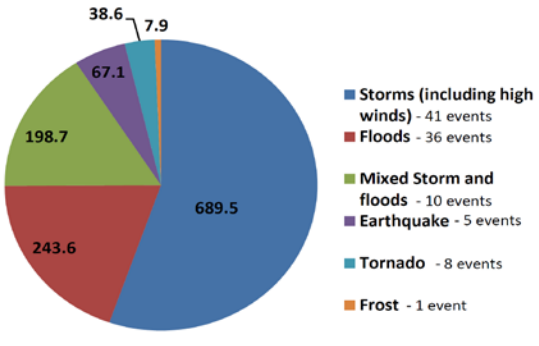
Figure 3.6: Massive gap between the economic and insured catastrophic losses



Source: Bernhardt (2011; slide 7)

paid in claims by the end of 2013 with this total still likely to increase (ICNZ Press Release, 2014) with an additional NZ$12 billion in claims expected by the EQC. However, losses from other events and other perils are not insignificant. Figure 3.7 combines the data provided between 1996 and June 2014 (excluding those losses from the 2010/2011 Canterbury earthquakes series) and also displays the numbers of events featuring on the ICNZ list of costly natural disaster events. Both of these highlight the significance of both storm and flood (and combined events) within this insured loss profile. Indeed, if only those events in the 18 months between January 2013 and June 2014 are considered only 10% have come from non-storm or flood related sources (in this case the Cook Strait earthquakes). Therefore, although the huge losses and claims from earthquake events have dominated attention in recent years, consideration should also be given to the more frequent, albeit smaller event losses, accumulating from floods and storms.

Figure 3.7: Disaggregation of the costs of natural disasters in New Zealand 1996-2014 (NZ$ million)[4]



NB – Excludes the 2010/2011 Canterbury Earthquake series. The legend also highlights the numbers of events combining to make the total aggregated losses

[3] see http://www.icnz.org.nz/statistics-data/cost-of-disaster-events-in-new-zealand/

4 International comparison of flood insurance and compensation

Undertaking an international comparison of flood insurance illustrates the variation in the devices and mechanisms used to share and bear the risk from flooding. These contexts are important because they will affect those instruments that can be implemented and ultimately have connotations for the transformation of any of these strategies for use elsewhere: including in New Zealand. It is clear that there are various factors that influence the recovery mechanisms present within a country and the options available to victims. These include socio-economic status, political ideology and economic climate. All of these are factors would impact upon the presence and type of flood recovery mechanisms and the balance between public and private options.

The key criteria for assessment of these international examples are efficiency, equity and robustness.

4.1 Efficiency

As described above (Section 2) by IIASA (1999) efficiency is the degree to which the loss-sharing arrangement is able to promote mitigation measures; whether that is at an individual level through property-level flood protection, at a community level (i.e. through the prevention of inappropriate development) or through national strategies (e.g. through the implementation of national construction standards).Therefore, any strategies which encourage mitigation at any level will be analysed.

4.2 Equity and fairness

A more challenging concept is that of equity and social justice within flood insurance and recovery. Huber (no date) has identified the different behavioural dimensions and responsibilities between different approaches to recovery from flooding. He identified the following for five countries to show the range of different approaches between the balances of responsibility.

- UK – individual responsibility
- US – collective, regional and individual responsibility
- France – collective responsibility of house-owners
- Germany – tax payers competing with private responsibility
- The Netherlands – exclusively collective responsibility.

This will be extended to the other countries explored in this study. However, notions of fairness can be considered to be very complex. From the UK perspective there are a number of studies which have examined the distributional consequences of flood management including their impact on insurance provision (HR Wallingford, 2008; Penning-Rowsell and Pardoe, 2012a; 2012b).

Additionally, O'Neill and O'Neill (2012) have examined concepts of social justice related to flood insurance in the UK. They identify three different approaches to fairness in the provision of flood insurance:

- "'pure actuarial fairness' – insurance costs to individuals should directly reflect their risk level;
- 'choice-sensitive fairness' – insurance costs to individuals should reflect *only* those risks that result from each individual's choices;
- 'fairness as social justice' – insurance in the provision of goods that are basic requirements of social justice should be provided independently of individuals' risks and choices."

Source: O'Neill and O'Neill (2012: 8-9).

They also identify two models of insurance provision for the UK, "***individualist, risk-sensitive*** insurance", provided through a market in which individuals' payments are proportional to their level of risk; and "***solidaristic, risk-insensitive*** insurance", in which those at lower risk contribute to the support of those at higher risk" (O'Neill and O'Neill, 2012; 6-7). These can be used and adapted to describe which type of approach is present in each international example. These concepts are however, quite difficult from the viewpoint of the general principles of insurability and may be interpreted in different ways. For instance, a 'solidaristic' insurance system may be considered one all of those 'at risk' from *flooding* share the risks and therefore premiums are lowered as those at lower risk 'subsidise' those at higher risk. This may also include being at risk from different types of flooding; with households potentially being at a higher risk from one type of flooding than another and other households being

more susceptible to the effects of a different type of flooding. However, most composite household insurance policies will spread the risks further than just flooding, with polices often including other natural perils or even wider with other 'perils' such as fire and theft being included. Therefore, the pool (and consequently the community across which the risks are spread) will vary between different types of policies.

There is also the need to consider the notion of solidarity in relation to other systems of recovery; such as state compensation schemes. In the most part these will be considered to be 'solidaristic' in nature as in general the losses of the few (i.e. those affected by flooding) will be borne by the many (the general population). This may be through different mechanisms but in the most part they rely on government intervention (at various levels) and are funded through taxation.

Similarly, the concept of risk-sensitivity may be interpreted in different ways. In the broadest sense this can be judged by whether the policy premium is linked to the risk. Arguably an insurance scheme which had fully-risk sensitive pricing would be one whereby a full-actuarial premium would be charged which would reflect the true cost of the insurance. In reality, this would make insurance too expensive for the majority. An individual flood insurance policy where premiums are altered according to the flood risk zone where a property is situated can be considered to be risk-sensitive. Conversely, a policy whereby a risk is bundled with many other perils with no premium adjustment for risk can be considered to be risk-insensitive.

However, comparable to the concept of solidarity, one might consider these not to only be absolute concepts. Consider for instance an insurance policy which provides cover for flooding and earthquake which is sold as an endorsement to a fire policy with an additional premium. If a flat-rate premium exists (i.e. the same premium for all those purchasing the policy) then it is more towards the risk-insensitive end of the spectrum as there is little differentiation according to risk. However, the existence of an additional premium might suggest that it is not completely risk insensitive either but this depends on the size of the premium, the terms of the policy and who is purchasing the insurance (i.e. if it is only available to those at risk). Equally, if a more risk-differentiated premium is provided in this example, due to the fact that insurance cover is available for both floods and earthquakes a premium may be adjusted based on an assessment of the flood risk, the earthquake risk or a combination of both. Depending upon how this is calculated will determine the degree of risk-sensitivity of the policy. The assessment in this report will consider the degree to which an insurance scheme is "flood-risk sensitive"; so even if there is some differentiation according to other risks, these systems will be considered to be risk-insensitive if premiums have no pricing related to flooding.

Fairness in flood management can be explored via different perspectives; for instance is a system which spreads the losses from flooding across many individuals fairer than one which spreads it across fewer people? This is of course what is happening in those situations where flood risks are compulsorily bundled with other perils and not differentiated by risk. However, is it fair that those who are not at flood risk effectively subsidise the insurance (and public flood management investment via general taxes) for those who are at high risk? There are some very complex arguments about social justice which vary depending on your view of justice and the justice principles or models that you use to assess it (e.g. Equality, Maximum utility, Rawls' Maxim in rule; see Johnson et al., 2008). Therefore, in order to adopt a simple approach the social equity characteristics of each of the strategies will be discussed, rather than an absolute judgement about whether a system is fair.

4.3 Robustness

The concept of robustness will be investigated in this report by examining the degree to which each insurance or compensation scheme effectively satisfies the general principles of insurance. Therefore, as well as identifying some basic descriptive characteristics (e.g. the types of flooding insured, the risk that flooding poses to a country etc.) one aim is to identify a number of key characteristics for each scheme. These include:

- Levels of insurance penetration (i.e. what percentage of the population, or at-risk population has insurance)
- How the insurance/compensation scheme is structured
- Whether insurance is an individual policy or bundled?

- The degree of risk-pricing for insurance premiums (i.e. is there an actuarial premium)
- Is cover is compulsory or optional?
- How insurance is purchased by individuals
- How the insurance scheme or compensation spreads and transfers the risk?

Although it is possible for an insurance system to be completely robust, in principle it will have a range of characteristics some of which make it more robust and economically viable and others which threaten robustness. For instance, there may be an individual flood risk insurance policy available at risk-reflective premiums which is a positive indicator of robustness; however insurance penetration maybe low which threatens the robustness and economic viability of the scheme. Therefore, it is necessary to combine all of the characteristics of schemes in order to undertake a full assessment of any insurance or compensation strategy. Robustness will therefore be presented on an indicative scale of **High, Medium** and **Low** to provide a comparison between systems.

4.4 International comparative review

This primarily desk-based review has been completed by initially looking at general reviews of insurance and flood insurance mechanisms[4]. A number of published reports were available as a starting point for analysis (Gaschen et al., 1998; Fiselier and Oosterberg, 2004; CEA, 2005; CCS, 2008) however these vary in their completeness and the recency of the information. Therefore, where possible (in terms of both availability and language requirements) these have been supplemented by verifying and reviewing the relevant legislation and other scheme documentation. In some instances schemes have been widely documented and critiqued whereas in others little information and data about the approach was accessible; therefore the descriptions of recovery systems provided here for each country is variable. Furthermore, to supplement the written information, the author has had many conversations with flood researchers in other countries (mainly European) to gain their advice and assistance in understanding recent or planned (and therefore relatively unpublished) changes to insurance systems.

Section 5 discusses the approach to flood insurance in New Zealand including both a consideration of the government backed EQCover as well as household insurance available via the private market. This analysis has been undertaken through examination of current and past legislation, official reports, press releases and grey literature. This information has been supplemented by a number of interviews undertaken with experts in the provision of insurance in New Zealand as well as those involved in retirement villages. These have been invaluable in providing insight about how the systems function in practice, the drivers of recent changes in approach as well as the lessons from the Canterbury earthquakes.

Information on each international approach is reported geographically in Appendix A. Section 6 provides a comparative assessment where countries are grouped and discussed according to the type and characteristics of the flood insurance or compensation mechanisms. The insurance situation(s) in New Zealand will be placed within these models and the similarities and differences with alternative approaches highlighted.

[4] It is important also to clarify that many of the countries included within the comparison also have social security systems which are likely to provide assistance for flood victims which suffer significant hardship as a result of flood damage (i.e. are left unemployed or their health is affected). Additionally, as part of many legal systems it may be possible for individuals and business owners in some circumstances to seek recompense under Tort Law if they are considered to have suffered losses due to negligence or other disadvantaging actions. However, the social systems and legal-sought recompense are not discussed as part of this report; the focus is solely on insurance mechanisms or funds which are specifically developed to provide compensation or financial assistance following natural events.

5 Natural hazards insurance in New Zealand

Insurance for natural events in New Zealand appears to have traditionally stemmed from concerns about, and the need to recover from, earthquakes; which has traditionally been the most costly natural peril in New Zealand (BRANZ, 2013). However, insurance cover is also available for other natural perils including volcanic hazards, tsunamis, landslides, storm risks, hydrothermal activity and floods. Cover for natural perils is provided in two main ways both of which have a role to play in assisting recovery from flooding: through the government organised Earthquake Commission EQCover and secondly through private insurance provided as part of a standard household domestic policy. When considering the potential of flood insurance to provide resilience to older people in New Zealand the main groups to consider are those older residents who reside in their own properties, those who are in rented properties and those who reside in retirement villages. This section introduces the different types of flood insurance available for these different groups and how insurance functions in New Zealand.

5.1 Earthquake insurance cover provided by the government

Natural disaster insurance originated in New Zealand in 1944 following damaging earthquake events in Wairarapa (1942) and was initiated by the passing of the Earthquake and War Damage Act[5] 1944. This Act mandated that cover against earthquake and war damages should be compulsorily included as part of all fire policies (CCS, 2008). The scheme was organised and regulated by a specially created government agency, the Earthquake and War Damage Commission. The scheme was supported by the Earthquake and War Damage Fund which was financed by a surcharge placed on all household policies. However, the scheme also had a State guarantee to assist in any shortfalls in the damage fund (CCS, 2008).

The original 1944 Act only covered damages from war and earthquakes; however it was soon extended and revised by additional legislation to include (and later remove) the damages from other perils (CCS, 2008):

- 1950 Act extended to cover extraordinary flood and storm risks.
- 1954 These additional perils were combined with volcanic eruption and landslide. Landslide was only incorporated automatically and without an additional premium from 1970.
- 1967 Authorised to insure against geothermal activity, but on a voluntary basis.
- 1984 The Act was again revised to generally exclude the risks of storm and flooding from residential damages; however limited insurance was introduced to provide 'land cover' (CCS, 2008).

This highlights that cover for flooding and storms were originally included in the scheme in the same way as other perils. The revision to this approach was considered to be due to the desire to refocus the risk on catastrophic risks (i.e. low probability, high magnitude and large damages) rather than the more frequent and smaller scale events. Evidence about why the damages to land from flooding remained within the scheme is lacking and therefore it is difficult to be certain of the reasons. One proposition is that retaining this coverage would enable communities to remain cohesive following large scale events.

Other changes have occurred over this period which has altered the status of the Commission. In 1988 it was made a Statutory Corporation which gave it autonomous powers and although it continued to be publicly owned the new status permits it to act as a commercial entity (CCS, 2008). However, the major changes to the Commission and the system of natural hazards insurance came with major reforms in 1993 and this remains the basis of the current scheme.

5.2 Earthquake Commissions Act 1993 and the provision of EQCover in New Zealand

The Earthquake Commissions Act 1993[6] was passed following concerns about the high risk potential of the existing approach and the presence of the state guarantee would mean that the New Zealand would have to meet high losses. CCS (2008; 116) argues that the 1993 Act "has the

[5] Earthquake and War Damage Act 1944, 8 GEO VI 1944 No 15

[6] Earthquake Commission Act 1993, Public Act 1993 No 84, 10th August 1993, Reprint as at July 2013.

fundamental aims of reducing the government's exposure to losses and allowing commercial interests to make their own decisions about insurance protection". Many of the reforms the Act proposed were not introduced immediately and there were transition arrangements to introduce changes slowly and allow those covered to take appropriate other action.

The first reform was to remove the provision for damages owing to war. This not only removed the peril but also required the renaming of the Commission (to the New Zealand Earthquake Commission) and the associated fund (Natural Disaster Fund). A second key reform was to exclude non-residential properties for cover; thereby no longer making it mandatory for fire policies to include natural perils for non-residential properties. Commercial properties and activities were excluded in recognition of the huge liabilities associated with the complete cover. As discussed above this cover was gradually removed and was achieved over two years by progressive reducing the level of cover provided from 100% to 75% in year 1, 50% in year 2 and finally 25% in year 3 and after 1996 no cover for non-residential properties was provided[7].

The Act came into force on 1st January 1994 and covers losses from the following natural perils.

- An earthquake, natural landslip, volcanic eruption, hydrothermal activity or tsunami; or
- A natural disaster fire (where a natural disaster fire is caused as a consequence of an earthquake, natural landslip, volcanic eruption, hydrothermal activity, tsunami or (in the case of residential land) a storm or flood; or
- A storm of flood (only in the case of damages to residential land *not* residential property)

The first key point relates to the fact that insurance cover for the recovery of flood losses is extremely limited and only concerns damages to residential land rather than residential property.

The specific details of the current system are set out in the Earthquake Commission Regulations 1993[8] which also came into force on the 1st January 1994. Coverage for natural perils is compulsory on all fire insurance policies and is purchased via the private insurance market. Fire insurance is not itself compulsory (and those who do not have coverage are also uninsured for natural perils) and therefore the penetration of natural hazards insurance is reliant upon the penetration of household fire policies.

5.2.1 Terms of coverage, settlement and excesses

Cover by the Earthquake Commission (or EQCover) insures home, personal possession and land (EQC, no date). This includes following:

- Separate homes in the same building.
- Separate buildings which are part of the home (e.g. sheds, garages)
- Services which are owned by the policyholder (e.g. water pipes and cabling) which are up to 60 metres from any of the buildings
- The contents of properties (but with some key exclusions including anything excluded as part of the base fire insurance policy)
- Land – the land under the property, land within 8 metres of the property and the land of the main access way (within 60 metres of the property) but not the driveway or any artificial surfaces that cover the access way

(EQC, no date; 6).

Residential dwellings are insured by the EQCover up to a maximum amount of NZ$ 100,000 (plus GST) and personal contents up to a maximum of NZ$ 20,000 (plus GST) (Earthquake Commission website[9], 2013a). Above these amounts the private insurer will pay any remaining losses according to the terms of the household (fire) policy taken out (i.e. this might be replacement of indemnity cover) (Consumer NZ website, 2011). Therefore, the scheme for these geophysical perils might be considered to be a first loss cover and thereby essentially acts as a large deductible for the private system. The principle of the approach is that the cap should be set at a level so that the majority of the claims are covered entirely within the EQC scheme. Indeed, even with an event on the scale of the Canterbury earthquakes the majority of claims are within the EQC cap; however this does not mean that private insurers have not been heavily exposed (see Section 5.3.1).

[7] Ibid, Section 41

[8] Earthquake Commission Regulations 1993, SR 1993/345, 20th October 1993, Reprint as at 1st December 2011. As amended by the Earthquake Commission Regulations 2010, 2010/348, 4th October 2010 and Earthquake Commission Regulations 2011, 2011/379, 31st October 2011.

[9] www.eqc.govnt.nz – the date refers to the last page update.

The EQC (no date) describes the level of cover that is provided by EQCover. A dwelling was insured against its replacement value; although until recently there was no specification that it needed to be reinstated to exactly the previous condition or the sum to be provided for reinstatement. Claims for damage to contents will be settled according to the terms of the base fire policy; that is either as new (replacement value) or taking into account the age of the property and wear and tear (indemnity value) (EQC, no date).

Cover for land is handled differently to dwellings. Damages to land are often of two types: mud and damage to the land from the movement of materials from higher up the slope or that is associated with the instability of the land, caused by landslips or debris flows. In relation to flooding this might include repair of the scouring of a riverbank (within a certain distance from the house) which may affect the stability of a dwelling or clearing land of debris or boulders left by flood waters (Earthquake Commission website[10], 2013b).

There is a capped liability for land which is calculated on the basis of the average size of the property in the area and is undertaken via a professional valuation of the land when a claim is made (EQC, no date). The calculation includes the value that is assigned to the land as well as a judgement about whether the land can be remediated in a cost effective way; this means that within the total liability there will potentially be some sort of mitigation which is undertaken. Therefore, when land is damaged, the EQCover specifies that the value of the land or the repair cost will be paid whichever is the lesser amount (EQC, no date).

5.2.2 Implications of treating floods differently to other perils within the EQC

Treating flooding differently from other perils may have implications for the definition of events: for instance the difference between damage to properties from debris flows or from flood waters. This is important because under one scenario the EQC would be liable for the first NZ$100 000 of damage to properties and under the second it would be the sole responsibility of a private insurer. Although examples of these types of definitional conflict are rare (although court cases have occurred) challenges may increase if liabilities rise and the system becomes stretched. A further issue relates to the tendency for damages to be conservatively estimated so that they do total above the capped amount. Although from an administrative point of view this is desirable as all the damages are claimed through the scheme, this puts a householder at risk of reimbursement at a level below that needed to cover all of the damages or repairs.

Although the Earthquake Commission Act 1993 sets out a standard level of indemnification it does provide for some discretion about how those insured will be able to recover. The Act[11] provides the Commission with the ability to settle claims by payment, replacement or reinstatement. Following a claim for natural hazard damages deductibles are also applied. This is specified in the Earthquake Commission Regulations and is calculated either at NZ$ 200 (per the number of dwellings in the building) or at 1% of the amount payable whichever is the greater amount and flat-rate deductible of NZ$ 200 is applied to residential property. For residential land there is also a relevant deductible which is NZ$ 500 for each residential dwelling that is situated on the land or 10% of the amount payable whichever is greater; up to a total amount of NZ$ 5,000.

5.2.3 Premium surcharges

The scheme is funded via an additional premium (surcharge) which is added to all household fire insurance policies. The net result is to socialise the risk and make the level of insurance much more affordable and the level of entitlement much higher than it otherwise might have been. These additional premiums are collected by private insurers and passed on to the Earthquake Commission. The premiums are not differentiated according to risk; rather they are calculated as a percentage on the insured value. The current surcharge payable is 15 cents (plus GST) for every NZ$ 100 insured as part of the fire policy up to a maximum surcharge of $180 (plus GST); NZ$150 for the building and NZ$30 for the contents. This is a threefold increase in premium since the Earthquake Commission Regulations 1993 which suggested that the surcharge on each premium should be 5 cents. It has been suggested that this rise is a direct consequence of the losses sustained due to the Canterbury earthquakes. The 1993

[10] www.eqc.govnt.nz – the date refers to the last page update.

[11] Earthquake Commission Act 1993, Section 29.

Regulations[12] also state that there is no additional premium associated with the coverage of land damages. Although premiums related to cover have increased it not clear how policyholders are reacting to these increases, nor indeed whether they are aware how much the surcharge has increased. The EQCover premium increases have occurred at the same time as other insurance premium increases as well as an increase in GST and therefore policyholders may not realise which proportion of the increase is due to the EQCover or the private insurance cover.

Following the payment of a claim, the Commission is also able to add an additional premium surcharge to reinstate and thus continue to provide insurance cover for natural hazards. This amount is calculated using a number of factors; the total payment received in relation to the total value of the property insured, the original premium paid and the number of days left to run on the annual policy. This additional payment recognises the need for the claimant to re-contribute to the funding of the scheme.

5.2.4 The Natural Disaster Fund (NDF) and government backing

The system was initiated with the backing of a state guarantee; this situation remains and thereby the New Zealand Government is ultimately the reinsurer of last resort. The Earthquake Commissions Act 1993 sets out the current terms of the Natural Disaster Fund, although this had existed in various guises as part of previous legislation (previously named Earthquake and War Damage Fund and the Disaster and Landslip Funds). The primary purpose of the fund is to be able to pay claims and thereby the premium surcharge (less the administrative fee paid to insurers for collecting the monies) is paid in to the NDF. The fund is the principal mechanism for settling claims and creating resilience to these hazards however the New Zealand government under the terms of the 1993 Act[13] are required to meet any shortfall and "provide to the commission out of public money such sums by way or grant or advance as may be necessary to meet the deficiency". Therefore, essentially taxpayers are responsible for backing the scheme although the wording of the Act suggests that the Minister is sanctioned to specify the terms and conditions by which financial resources are provided. Consequently, the NDF may be required to reimburse some or all of these funds back to government once the fund has been restored to healthy levels.

In order to make best use of the resources, the NDF is invested and since 2001 there has been a move to invest more of it on the international equities market than previously when the majority was invested in New Zealand securities (EQC website, 2012). Two reasons led to this shift: to obtain a better return on investment and to spread the assets more widely; thereby ensuring that the funds were not all affected by the same disaster. As of 2008 it was suggested that 30% of the NDF was invested overseas on the international equities market and 70% remained invested in New Zealand securities (EQC, 2008).

However, the fund does not only rely on government backing, the EQC scheme also invests in reinsurance provided by the global reinsurance market. Machetti (2009) suggested that the Earthquake Commission takes out against losses which exceed NZ$ 1.5 billion following a severe disaster. The reinsurance cover provides additional funding of up to NZ$ 4 billion. The reinsurance cover is negotiated over a three-year cycle which if another disaster over NZ$ 3.5 billion occurs then further reinsurance cover is activated with a NZ$ 1 billion attachment point (Machetti, 2009).

Although the NDF was called on to pay for small numbers of claims, in general prior to the 2010 and 2011 earthquakes the premiums exceeded claims and the fund was able to grow and it was reported that in 2008 it totalled NZ $5.6 billion). More detail about some of these issues and how the fund functioned in relation to the Canterbury Earthquakes is discussed in Section 5.2.6.Following the Canterbury Earthquakes the system is under NZ Treasury review, the potential implications of which will be discussed in more detail in Sections 5.2.7 and 7.3.7.

5.2.5 EQCover and mitigation

There does appear to be some provision for incentivising mitigation within the EQCover system of insurance in New Zealand and this may be through three main ways: a refusal of insurance, via the relocation of properties/land following a claim or via limiting its liability. The first of these is specified in the Earthquake Commissions Act

[12]Earthquake Commission Regulations 1993, Section 3(3).
[13]Earthquake Commission Act 1993, Section 16.

1993[14] which details the circumstances in which insurance can be cancelled.

It states that cancellation is permitted and will remain by written notice where:

"(a) the Commission settles a claim in respect of any property by payment of the full amount to which that property is insured under this Act; and
(b) the property in respect of which the claim is settled is neither replaced nor reinstated to the satisfaction of the Commission"

Earthquake Commission Act 1993 S. 3; part 4.

A cancellation order remains on the property, regardless of whether a new policy is purchased or if a property has new owners. A homeowner would be required to apply in writing for the reinstatement of insurance and the Commission would need to consider and agree why a cancellation would no longer need to apply. This provision in the legislation may enable the Commission to place some requirements about reinstatement and potentially to make a reduction in the risk whilst doing so; however it is unclear how often these clauses are enacted or if they are monitored.

A second power that the 1993 Act provides is that the Commission may relocate properties instead of reinstating them. This may be because the site becomes unusable, but it may also be related to damage which it is "likely to suffer[15]". This provides options for the Commission to reduce the highest risks: however it is unclear how often this power is utilised to reduce the Commission's exposure and reduce repeated claims.

The third incentive for mitigation may be through the limiting of liability of the Commission for those properties which it considered to be a high risk. The 1993 Act states that the Commission may limit its liability by declining future claims via written notice where it "considers that any property is in imminent danger of suffering natural disaster damage" (New Zealand Government, 1993; Schedule 3; part 5). This is mainly to prevent repeated claims as it primarily affects those properties which have already been affected and where:

"the Commission considers that -
(i) the property or any part of the property is likely to suffer the same, or substantially the same, loss or damage again; and
(ii) the likelihood of such loss or damage could reasonably be or have been avoided"

Earthquake Commission Act 1993 S. 3; part 5

Property-owners would have to demonstrate that they have reduced their risk in these situations in order to have their insurance cover reinstated. In addition, the Commission has the ability to refuse a claim if a property owner has failed to adhere to any law or bylaws and that failure has caused or exacerbated any damages or that the property was not constructed in accordance to the appropriate standards[16]. Both of these may be incentives for those insured to make certain that their properties are well built; however the effectiveness of this condition may be hampered by low risk awareness. Many policyholders may not realise that they are at risk until they are directly affected and they are required to submit a claim.

As discussed in Section 5.2.1 above, when claims are made as part of the EQC for damages to land attention is paid to the remediation of the risks. When mitigation is undertaken for land, it is often done collectively. Often more than one property is affected by landslips and so it is more (cost) effective and so there will be a small area wide mitigation that is undertaken, reconstruction of a retaining wall or deeper geotechnical works. This is a fairly common occurrence as landslides associated with flooding are quite frequent. However, where the costs of the remedial works exceed the costs of total liability the homeowner will receive a cash settlement which is compensation against the loss. There is however, no specification within the Act that these monies are required to be spent on remediating the damages or mitigating against any future damages. This is an important omission as the consequences of not taking action to reduce future risks impacts not only on the individual householder who has taken the decision but also their neighbours.

It is unclear how effective these measures are in leading to mitigation and a reduction in future risks. It has been suggested that there is not a following up of all individual cases, but that in most instances remedial work is undertaken and that there is an ongoing relationship with the

[14] Ibid, Schedule 3
[15] Ibid, Schedule 3; part 10
[16] Ibid, Schedule 3; part 3.

homeowner through that process. There is also the requirement that if a property has received a pay-out from the EQC it will be recorded on the Land Information Memorandum (LIM) which is held by the local authority. This means that a potential buyer is able to see what was claimed and assess if any mitigation has been undertaken.

5.2.5.1 *Increased Flood Vulnerability* (IFV) land damages

The EQC have also proposed some future mitigation efforts to reduce the vulnerability to land from flooding caused by earth movement. Although it is possible to report the current status of this work and its potential implications; however it is too soon to state the conclusions of these efforts as various approaches to the issue and policies are still being debated.

Areas which are put at increased risk of flooding following land movement are entitled to claim for land damages as part of the EQC. *Increased Flooding Vulnerability* (IFV)[17] has occurred in a number of areas around Christchurch (an already low lying area) as land heights fell following the earthquakes. The EQC are still undertaking modelling and lidar surveying to try to identify properties which may now be at higher risk due to the results of the earthquakes and then work to settle these claims. This is a very complex area and there is high potential for confusion and dissatisfaction around this process. The EQC need to try to separate those increases related to earthquake impacts from increased flood risk caused by other factors (such as climate or land use changes); it is likely that there will be some people who may attempt to attribute their flood damages and changes in risk to earthquake damage even if these are not linked. Additionally, there may be some people who have already been flooded due to their increased risk. Under this scenario the EQC will still settle on the land damages but any property damages are the responsibility of the private insurer: however this situation is complicated if the flooding occurred mid-way through the reconstruction or repairs to a dwelling damaged during an earthquake.

Furthermore, there is no guarantee that residents will use their settlements to mitigate their increased flood risk, although as described above the EQC scheme definitely advocates a mitigation approach where possible. Indeed, with rising private insurance premiums in flood risk areas policyholders in the future will be incentivised to use these pay-outs to take action to reduce their susceptibility to flooding.

Indeed, there are also some potential fairness issues to consider. Some residents may question why residents whose flood risk has been increased by earthquakes are entitled to land damage payments; whereas residents whose risks are being increased by other factors (such as sea level risk or climate change) are not being treated in the same way by the government. At a basic level both events (earthquakes and climate change) are not the fault of the resident and if they have insurance policies, both will have taken measures to secure their financial recovery and pay into the EQC under the same terms; yet their potential outcomes will be significantly different.

When claims are made, mitigation is possible, however the Act precludes the subsidisation of these measures and therefore financial assistance is only available within the value of a settlement. Additionally, because the premium surcharge remains low (even with the increase it is only a maximum of NZ$207) there is no capacity to incentivise people through premium reductions to take mitigation actions. Thereby, in a proactive sense the EQC involvement in mitigation is primarily through research and education and the funding of programmes to increase understanding of hazards and communicate this to homeowners as well as professionals involved in risk management (e.g. land use planners, engineers, designers, architects).

5.2.6 Implications of the Canterbury Earthquakes on Earthquake Commission Coverage

This section will discuss how the EQC functioned following the Canterbury earthquakes and the impacts that this has had on the scheme and may have in the future. The NZ Treasury has estimated that the total cost of the Canterbury earthquakes is around NZ$30 billion. The scale of this is most appreciated when considering that this value is around 15% of New Zealand's GDP (EQC, 2011). It is clear that the earthquakes have really tested the scheme and were unprecedented in the history of the scheme. EQC (2011) highlight that the last highest single event was an earthquake in

[17] What this type of land damage is called.

Inangahua in 1968 whereby a total of 10, 500 claims were made and average claims were in the order of 5, 000. The EQC 'Scorecard'[18]as of end March 2014 highlights that there have been close to 631, 000 claims[19]. However, it is also useful to break this down into the type of claims. There have been over 750, 000 exposures[20] received by the EQC of which 56% are for buildings, 25% for contents and 19% for land. The majority (97%) of contents claims have been settled, but there is still many land and building claims still to be completed some three years on from the 2011 earthquakes with only 57% and 50% of claims completed respectively. The total amount paid out in settlements by the EQC as of the end March 2014 is just under NZ$7 billion (including GST) although the EQC estimate the total settlement will finally be in the order of NZ$12 billion.

It is also important to recognise that during this period, the EQC has not only been responding to the Canterbury earthquakes. January 2011 saw damages from Cyclone Wilma and a large landslip event, a tsunami occurred in March 2011 and Hawkes Bay landslips in April 2011 (EQC, 2011) as well as other events, such as the 2013 Cook Strait earthquakes, over the following three years. Although the EQC had undertaken modelling in 2009 about what they thought would be a large exposure event (an earthquake in Wellington), in fact the 2010 and 2011 earthquakes sequence event led to claims around 4 to 5 times this scale (EQC, 2011). Furthermore, the modelling was undertaken on the basis that there would be one event with associated claims whereas in fact 14 different 'claim events' occurred within the earthquake sequence which has led to added complexity (and workload): as claims have to be verified and caused issues of duplication and a new system developed to attribute damages to the relevant and correct events.

From a response perspective, although the EQC considered their ability to deploy personnel into the field; however they acknowledge the inherent difficulties in scaling responses from small and medium events to these two huge events and that it has had a detrimental impact upon the personal experiences of customers. To try to respond more quickly to claims a new system was implemented whereby claims under NZ$10,000 were fast-tracked and paid a cash settlement. Although this may ease some of the issues for the EQC and also made the process more rapid for many (potentially frustrated) policyholders, this may have created additional problems and concerns for older people as it meant that they have to manage their own repair processes. The potential issues with this are described further in Section 7.3.5.

The Canterbury earthquakes have highlighted some of the idiosyncrasies of having this dual system of coverage in which some perils are treated differently than others and for risks where the land and properties may be affected differently. There may be instances where there may be no damage to a dwelling but damage to the land makes the house dangerous to live in (e.g. at the top of a cliff that has become unstable). In this scenario if a resident has property insurance they will get a pay-out in accordance with the Act for the damages to the land; however a local authority may deem the property unsafe and permanently prohibit inhabitation. In this scenario they will not get any recompense from their insurer as there is no damage to the house. Equally the EQC is not able to offer any more compensation beyond what is stipulated in the Act and so will not be able to give any additional monies for the undamaged house. There were some occurrences of this following the Canterbury earthquakes and the re-designation of the land in the red zone: an example of which in relation to retirement villages is provided in Section 5.4.2.

In summary, despite the unprecedented and unexpected scale of the earthquake sequence, the EQC scheme (and the insurance industry more broadly) has functioned well and with the assistance of the government the scheme has been able to meet (and continues to meet) its obligations. The pooling nature of the scheme has worked and the risks to those affected by the earthquakes spread more broadly. However, there is still much more work to do and those who are still out of their homes or who are still awaiting their settlements may be frustrated by the process. Additionally, the NDF has been depleted by these events and thereby the future viability and stability of the scheme needs to be examined going forward. The threefold increase in premiums is a

[18] Data as of 28th March 2014, www.eqc.govt.nz/canterbury-earthquakes/progress-updates/scorecard

[19] The Act specifies that each event has to be treated as a separate claim and therefore these 631, 000 claims may not each equate to a separate claimant as some may have made separate claims for the 2010 and 2011 sequences of earthquakes.

[20] Building, land and contents can be included as part of one 'claim' however separately they are termed exposures.

move in the right direction as it begins the process of recovering the resources paid out by the scheme; although it is unclear how the scheme may function if highly damages earthquakes occur before funding levels significantly increase. It is likely that significant government intervention would be required and a review of the system has resulted to consider these issues and the role of the scheme going forward.

5.2.7 New Zealand Treasury review of Earthquake Commission Coverage

The *terms of reference* for the New Zealand Treasury review of the EQCover provide details of the review which has primarily been initiated by the 2010-2011 Canterbury earthquakes (NZ Treasury, 2012). However, discussions of the reviews of the scheme predate these events. For instance, EQC (2008) argue that Act had not been reviewed or revised since its introduction in 1993 and provides arguments for revising a number of issues including raising the cap on the insurance cover, considering the relevance of the coverage for land, considering issues of how to encourage homeowners to increase the safety of their properties and how to manage the disaster fund to encourage sustainability.

The Treasury Review aims to learn the lessons from the Canterbury earthquakes and to ensure that the earthquake scheme remains viable into the future. In particular the review suggests it will focus on:

- What the EQC insures, the structure and extent of the EQCover (including the layers of loss, the types of disasters and property covered, whether the scheme should continue to be mandatory and whether the caps and excesses should be reformed.)
- How the EQC prices its insurance (including issues such as whether it should be risk based or whether there should be reform to the collection mechanism).
- Institutional design (including what roles and expectations should the crown have and the structure of the form)
- Financial management of the Crown's risk exposure (including the financing of the risk, the size and composition of the NDF and alternative instruments)

Following the earthquakes the EQC made some recommendations to the incoming Minister in 2011 about those changes they thought would enable the scheme to function better and these are likely to be considered and debated as part of the review (EQC, 2011). Of particular relevance to this study is the potential removal of the land cover for flooding and storms, this may be because it is considered to be outside of the core remit of the scheme which is to assist in the provision of the catastrophic risks and protect against market failure. If removed from the EQC, it is unlikely that land would subsequently be covered by the private market as the coverage of land damage is something that has traditionally not been considered.

Furthermore, a number of other recommendations of the EQC (2011) have wider implications for the private household insurance market (and thereby the provision of flood insurance) firstly through increases to the premiums. The current premium surcharge has already been increased threefold and further recommendations include introducing differential premiums (potential based on flood sizes or construction type) which would also increase the premiums further. For the EQC, this would have the impact of increasing the monies coming into the NDF and reducing moral hazard; however these increases may impact upon the affordability of household insurance for some. Additionally, potential changes to the EQC cap will also change the balance between the EQC and private insurers. The current caps (of NZ$100,000 and NZ$20,000) are generally considered to be too low. Although the cap was considered to be sufficient to cover the majority of claims from Canterbury, the caps have not been changed since 1993 which is leading to a number of different factors:

- It is limiting the premium income of the EQC
- The cap means that the owners of more expensive properties are being subsidised at the expense of the owners of less valuable homes – this would not be the case if there was a higher cap as the more expensive property owners would have to contribute more.
- Due to the inflation, when there is a total loss of a property the exposure of the private insurer is quite high as the cap is set at $NZ100,000 whereas the average rebuild cost is around NZ$500,000.

A number of proposed changes to the cap have been suggested. These include raising the cap,

removing the cap entirely and the EQC taking all the premium income for these perils and consequently covering all of the loss or to pro-rate the EQC contribution in relation to the liability of the private insurer and thereby having a variable contribution rather than a fixed cap and a move away from a first loss insurance system (EQC, 2011).

5.2.8 Summary characteristics of the current Earthquake Commission Coverage

Table 5.1 provides a summary of the EQCover highlighting both the key characteristics of the approach as well as how it can be categorised according to the three assessment criteria of efficiency, equity and robustness. Generally, the scheme provides an effective way of spreading the risk from natural perils (even though its contribution to recovery from flooding is limited) in a very wide-reaching way between all policyholders across the country, rather than in a private system whereby risks would only be spread between those policyholders within coverage from a single insurance company. Additionally, the government-backed system has enabled the provision of widespread cover by guaranteeing the Natural Disaster Fund or the reserve. Without this state intervention it is unclear whether the private insurance market would offer full coverage as the loss exposure from earthquakes is particularly so high. The potential exposures were exposed by the Canterbury earthquakes. These events have highlighted the difficulties in providing a universal scheme backed by the government and have highlighted the potential for losses well in accidence of the pool that require government intervention. However, the earthquakes at the same time have reinforced the need for some kind of coverage which provides recovery from these types of natural perils and in particular mandatory earthquake cover: a situation which is not replicated in some other situations whereby participation in a scheme is optional (i.e. California, Japan etc.).Recovery from the impacts of the Canterbury earthquakes would have been more difficult without the presence of the scheme, the framework for assisting victims and funds accumulated the NDF and it is likely that the New Zealand Government would have had to shoulder increased responsibilities.

Table 5.1: Summary table for cover for natural perils as part of the EQCover policies.

Insurance scheme:	State-organised and back insurance administered via private insurance.
Types of perils and flooding covered by insurance:	Dwellings and land are covered for the following perils: earthquake, natural landslips, volcanic eruption, hydrothermal activity or tsunami; or a natural disaster fire. Flood damages to residential land only are covered as part of the scheme.
Optional/ compulsory cover:	Compulsory if a homeowner has a household policy as cover is included as part of fire cover.
Insurance premium mechanism:	A formalised cross-subsidy surcharge at a flat-rate per sum $100 sum insured for all policies.
Risk transfer mechanism:	Bundled across all household policyholders and between the perils covered.
Penetration/ coverage of flood cover:	Penetration should be the same as for insurance as a standard peril (see below) and thereby be quite high as if a homeowner as a mortgage it is compulsory to have household insurance – however may be threatened by the general rise in insurance premiums and a reduction in homeownership.
Presence of state aid or compensation:	No.
Summary:	Recovery to land damage caused by flooding is covered as part of the EQC scheme.
Key principles of the recovery system	
Efficiency:	There are some elements of mitigation tied to the scheme although the monitoring and enforcement of these components might need to be strengthened to be truly effective.
Equity principle:	*Solidaristic, risk-insensitive* insurance – as all policyholders are included and there is no pricing difference between risk areas
Robustness of recovery system:	*Medium to high*– in principle this system should be quite robust as it permits the collection of a reserve pool to meet claims and thereby spreading the risk widely between policyholders. However, large events may threaten the viability of the Disaster Fund which may require additional government resources in the future. The system is sufficiently flexible to increase the surcharge and thereby balance premium income and likely claims.

5.3 Flood insurance coverage as a standard household peril

Flood insurance for dwellings is available as part of a standard household policy in New Zealand. Henderson (2012) suggests that an 'all risks' policy to complement the cover of the EQC has been available since the 1960s although other household insurance had been available prior to this and fire policies in particular had a much longer tradition.

Insurance cover is provided by the private insurance market as part of a composite policy and is bundled with other perils including theft and fire and separate policies are available for both contents and buildings insurance. Premiums are offered on a sum-insured basis and there is no such thing as a 'standard' household policy and insurers will compete on conditions terms as well as price: however generally, policies are settled on a full replacement (new for old) basis. Private household insurance policies not only provide coverage for risks that are not included within the EQCover scheme but also if damages reach the level of the cap then the difference will be covered by the private insurers.

Household insurance penetration rates are generally very high: in the order of 90% to 95%. The reasons for such a high coverage are a little opaque and are likely to be due to a combination of factors. High structural insurance will be tied to the compulsory requirement for mortgage holders to have coverage. This is also coupled with very high rates of homeownership at present in New Zealand[21]. Penetration of contents is anecdotally

[21] Although this is changing – see Section 7.3.1 for the potential impacts of demographic changes on insurance cover in the future.

lower but still higher than a lot of other countries and it is usual for people to have coverage.

Generally, New Zealand is served by a small group (in global terms) of private insurers dominated by Australian firms: only around six companies offer residential insurance. Despite this, the market works well and is competitive, although the impact of the Canterbury earthquakes will latterly be discussed. One might consider the insurance market in New Zealand to be quite specialised as the natural risks are quite complex. The market is reinsured via the global reinsurance market.

5.3.1 Recent changes to insurance provision, drivers of change and the implications of the Canterbury Earthquakes on (flood) insurance provision

The principle of the EQC approach is that the cap should be set at a level so that the majority of the claims are covered entirely within the EQC scheme. Indeed, even with an event on the scale of the Canterbury earthquakes the majority of claims were within the EQC cap; however this does not mean that private insurers have not been exposed to these risks. The EQC (2011) estimate that 15% of buildings insurance claims will be passed on to private insurers and 5% of contents claim. Difficulties emerge when properties suffer from extensive damages (or even total loss) as there is a potentially large difference between the NZ$ 100,000 cap and the full rebuild or repair costs. By the end of 2013, private insurers had paid out over NZ$10 billion in claims from the Canterbury earthquakes (ICNZ Press Release, 2014). Of this total amount NZ$6.7 billion are for commercial settlements and NZ$3.5 billion in 'over cap[22]' residential claims.

The majority of insurers had a difficult time following the Canterbury earthquakes. Indeed, one mutual (AMI) required government assistance to save it from insolvency (see Section 5.3.1.3). Despite, these short-term difficulties the market has rallied and following a number of difficult years the household insurance has returned to a situation of profitability; although the experience of Canterbury has led to some significant changes within the industry. In addition, other factors such as the increase in technology and mapping and concerns over climate change and new development are also driving changes to the industry.

5.3.1.1 Premium increases

One of the most noticeable changes to policyholders has been an increase in premiums in the two to three years following the Canterbury earthquakes. But premium increases have also been due to the large number of weather events over this period (in particular in 2013). The average premium is now in the order of NZ$800 to $1000 which for most has been an increase of 30%: with the premiums for some households rising by as much as 50%. This has been occurring at the same time as the premium surcharge increases to the EQC and then increase in GST so most households are now paying significantly more for their policies than in the past. This may be creating issues of affordability both now and in the future, the implications of which are discussed further in Section 7.3.1.

5.3.1.2 The move to a sum-insured value

Another fundamental change following the Canterbury earthquakes has been a change to the basis of premium calculation. Prior to the earthquakes the market used quite an unusual system of offering total replacement cover on the basis of the square footage of the property. This was considered to be an inflation-proof system which did not rely upon an estimation of the value of the property. Policyholders would insure on the basis of the size of a property and if this property was destroyed it would be reconstructed to that same size, whatever the cost of that replacement. Although this system worked for many years over the last 20 years or so there has been quite a competitive market for insurance and thereby premiums were kept low at the same time as entitlements were going up and there was pretty much open cover for full loss, which proved to be catastrophic for a couple of companies as their exposure was too high.

However, this approach has now been replaced by a more common system of insurance-based on the 'sum insured' which reduces many of the uncertainties present with the old system and allows insurers to manage their risk better. So as policyholders' renewals have come round, they are being moved to the new system which raises questions about whether people understand the new system and whether they are insuring correctly and for appropriate sums. Both under-

[22] These are the amounts payable by private insurers over the first NZ$100,000 losses paid out by the EQC.

insurance and over-insurance emerge as issues. Over-insurance means that policyholders will be fully covered in case of a loss; however it means that their premiums will be higher than they need to be and may unnecessarily lead to affordability issues.

Underinsurance creates problems for both insurers and policyholders. If a policyholder is underinsured at the time of the loss it means that they will not be fully compensated which may threaten their financial recovery from flooding events. From a positive perspective, the 'condition of average'[23]is prohibited in New Zealand on dwellings under the Insurance Law Reform Act 1985 [24] and on commercial properties it is required that the clause be fully disclosed [25] although in reality in New Zealand few commercial insurance contracts are subject to the condition of average. This means that for domestic dwellings the policyholder will receive the full value of the claim (up to value of the sum insured) even if there is partial loss and thereby the implications of underinsurance are reduced. Nevertheless the impact of underinsurance is likely to be significant; particularly in the early periods following the change when policyholders are trying to understand the new systems. This is supported by evidence by the ICNZ which has suggested that 60 to 70% of homeowners have opted to cover their property for a 'default' value: i.e. an estimated average cost to rebuild a 'standard home' rather than estimating a more appropriate sum of coverage. It is feared that for many properties this amount would be insufficient to completely rebuild their home if it was destroyed and is reducing the resilience of many citizens to recovery from all perils. This choice may be in some cases due to convenience or not wanting to engage with the changes to the system, in many will be related to a desire to pay the increased premiums (insurance is estimated to increase by NZ$40 per additional NZ$ 100,000 covered) and lastly may be related to a lack of understanding about how to estimate the value of the property. Companies providing valuation assistance have emerged in New Zealand following the change to the sum insured which may in some cases limit the potential for underinsurance. However, the use of these services may currently be limited.

However, the prohibition of the 'condition of average' may cause problems for private insurers as they will need to deal with partial losses which approach the total value of the sum insured; whilst only receiving the premium for the under-insured value. Thereby, this situation has to be built into insurers pricing models to cover potential claims and as a result a price margin may be added to all premiums: thereby again increasing the costs for all.

5.3.1.3 The changing relationship between government and private insurers: Increasing regulation and changes to the provisions of reinsurance

Traditionally, the insurance industry in New Zealand has been self-regulatory and there has been very little intervention into the private market by the government (other than of course the first loss cover provided by the EQC). The scale of the Canterbury earthquakes has increased the awareness of the NZ Government about the potential for losses and in particular their need to step in and support a failing insurer following the Canterbury earthquakes has exacerbated their concerns. AMI (a domicile mutual company and predominantly South Island company) had been operating in New Zealand for a long period of time, had a large market share (c. 35%) and was the country's second largest residential insurer (Steeman and van den Bergh, 2011). Therefore, when there was the potential for them to become insolvent following the earthquakes, they were considered too large to fail (as the numbers of people impacted would be high) and the government (i.e. the general taxpayer) bailed them out.

The Government agreed to put in NZ$500 million of resources to fund the companies earthquake liabilities although admitted that more (and up to NZ$1 billion) may be needed (NBR, 2011). As a result of this situation the government has imposed greater regulation on the industry. In order to operate, insurers are now required to have a license and the regulator, the Reserve Bank,

[23] A potential condition on an insurance policy which takes account of the difference between the sum insured and the actual current value of a property (i.e. the degree of underinsurance). In situations whereby this clause exists when partial loss occurs the pay-out received on the insurance will be calculated (pro-rata) to the same proportion as the value of the underinsurance. For instance, if the current value of a property is NZ$500,000, but it is only insured for $350,000, in the event of a loss of $250,000 the policyholder will only receive $175,000. The total sum insured is only paid out in the event of a total loss and in the scenario above this will be NZ$150,000 less than the true value of the property,

[24] Insurance Law Reform Act 1985, Section 15.

[25] Ibid, Section 16.

has imposed stricter conditions of reinsurance as insufficient cover was considered to be one of the reasons why AMI ran into difficulties. Insurers are being (gradually) required to increase their reinsurance cover and by 2016 will have to purchase cover for a1 in 1000 year event: a very high amount by global standards. Insurers will need to pay more for this cover which will inevitably be passed on to consumers; thereby again raising premiums for the homeowner. However, this increased coverage and regulation means that it will be less likely that insurers become overexposed in the future and that if one does it may be due to failings of the regulators to enforce the rules.

5.3.1.4 Improvements in technology and mapping and its impacts on understanding flood risks

Risk-reflective pricing in New Zealand is in its infancy and many of the insurers are only just starting to use the new geographical tools which have become available to work out what the risks really are. A move towards the use of these tools has been prompted by a number of factors: losses sustained by the earthquakes and a desire to better understand their exposure to all hazards; technological and data improvements which has meant that these tools are now available; and finally the Australian floods. The latter of these factors should not be underestimated as many of the insurers are Australian-owned companies and suffered heavy losses in the Queensland flooding.

New geotechnical maps are being incorporated more routinely into the systems of insurers and are starting to get a more holistic view of their risks and exposure. Prior to these tools insurers were reliant on data about historical events and claims: but now they are able to provide an estimate (although with a degree of uncertainty) for a particular property and determine a likely flood probability for that location. This ability is starting to reshape how insurers are underwriting flood risk and they may choose to underwrite different hazards (including flooding) separately to create the policy premium. It is difficult to say precisely what the impact of this will be on the insurance market although there are a number of foreseeable possibilities:

- There will be a greater differentiation of premiums based on flood risk; i.e. those at higher flood risk will pay more than those at lower risk
- Premiums for high risk properties will rise – although the degree of this increase is unknown and will depend upon other factors such as the competitiveness of the market
- Deductibles for flood may be increased in areas at high risk of flooding or the entitlements may be limited in certain situations.
- Cover for high risk areas may be withdrawn.

Although many of the above will prove to be problematic for some policyholders (i.e. those located in areas of high risk), insurers' ability to price their risk more effectively is positive for the resilience of the industry. Additionally, some might argue that if considered solely from the viewpoint of flood risk, it creates a fairer system whereby those at very low risk are not paying the same amount as those at high risk – although without some element of cross-subsidisation the principles of insurance are not fulfilled. The transition period from non-risk reflective pricing to one whereby there is some degree of flood risk-reflective pricing is likely to be the most difficult.

5.3.2 Private insurance and the mitigation of flooding

Mitigation against flooding in New Zealand currently has a focus on minimum flood heights. Local councils in areas of high flood risk have the ability to set minimum heights and to put these requirements into the building costs for new builds. If a house was considered to be a total loss and had to be completely rebuilt then an insurer would be required to build according to these standards otherwise they would not be able to gain building consent. However, in the majority of situations related to flooding this is not the case and in most cases the policy is worded in such a way that it is only the damaged parts of the property that need to be tackled and that it is not the responsibility of the insurers to bring the undamaged parts of the properties up to the standards. However, raising properties is very expensive and thereby the cost is generally prohibitive for insurers to consider as they will not undertake any betterment activities. When a property is damaged it will be repaired like for like and it is unlikely that floor heights will be raised.

Other types of mitigation to flooding such as flood-proofing, the use of flood gates or other resilience measures are quite rare in New Zealand; partly

The example of Queenstown flood mitigation

Heavy rain causes flooding problems related to rising lake levels by up to 2 meters and causing water ingress to hotels on the lake shore front. Claims were into the multi-millions and the insurers were still providing flood cover but they imposed fairly large deductibles on those risks that were flooded. The building owners when rebuilding and refurbishing these properties undertook repairs that made ground flood areas were more resilient and easier to reinstate in the future. Additionally, as the lake does not rise immediately and there is considerable warning (a rare situation in New Zealand), it allows businesses to remove all of the soft and hard fixtures on the lower floors. This minimises damages and thereby once the water recedes the properties can be hosed out and they have been very successful in recovering quickly from flooding and this is a good example of positive adaptation action.

related to the typical type of construction. It is hard to fit resistance measures to timber properties because they are not waterproof and this limits the opportunities for the use of these types of resistance oriented property-level measures and thereby if water reaches the floor level then it leaks through the structure of the property. This highlights a potential conflict between mitigation for earthquakes (whereby ductile materials such as timber are favoured as they are less likely to fail in the same way as brick or concrete) and mitigation from flooding which often requires stronger and more waterproof materials. The structural resilience of buildings to flooding (and other natural hazards) has been undertaken by BRANZ also as part of the *Community Resilience and Good Ageing* research[26].

However, there are options for mitigation at a more community scale. An example of this was in the case of a repeatedly flooded housing development in the North of New Zealand around 18 years ago. Insurers threatened to remove coverage following the third consecutive flood in three years. This prompted the local council to take mitigation action. The housing development had been built on marginal land that had been swamp and so the council was able to install a series of pumps which are used in times of heavy rain and the development has been free from flooding.

5.3.3 Reducing future risks

Mitigation may become more important in the future in order to manage future flood risk. The flood risks in New Zealand are considered to be increasing due to climate change. In particular rainfall is expected to be more intense, sea levels are set to rise as well as increasing storminess all of which have the potential to impact upon the frequency and severity of flood events (NZ Ministry for the Environment, 2010).

Pressure on land in some areas of New Zealand is increasing and as a result, there is concern by insurers that exposure to flood risks are increasing as developers build in inappropriate areas which are at high flood risk. In many cases this may be because local councils do not have sufficient resources to fight developers or even when it is taken to an environmental court the council's objections are rejected on the grounds of economic considerations. Flood risk areas are potentially being targeted for development because often the land is less expensive and even when developers adhere to the requirements for drainage set by local councils this is not always sufficient to prevent flooding.

Insurers would like councils and environmental courts to further consider the implications of development in these areas, particularly under future climate change scenarios and new development constructed in known areas of flood risk may be some of the first locations insurers decide to exclude from cover in the future.

5.3.4 Summary characteristics of flood insurance coverage for domestic dwellings

Table 5.2 provides a summary of the private cover highlighting both the key characteristics of the approach as well as how it can be categorised according to the three assessment criteria or efficiency, equity and robustness. The high penetration of cover is one of the key characteristics of the approach as it means a wide group of policyholders through which to spread the risk; although the actual degree of risk spreading is that within a company. The bundled nature of the policies also means that flood risks are pooled and cross-subsidised and transferred

[26] http://resilience.goodhomes.co.nz/publications/

between different types of risk. Flood insurance at the moment is considered to be risk-insensitive, that is premiums are generally not altered and priced on the basis of flood risk.

Table 5.2: Summary table for the provision of flood insurance within standard household policies

Insurance scheme:	Bundled insurance via the private market.
Types of perils and flooding covered by insurance:	All types of flooding for dwellings are generally included within standard policies.
Optional/ compulsory cover:	▪ Buildings insurance is compulsory with a mortgage loan. ▪ Contents cover is optional.
Insurance premium mechanism:	Premiums are cross-subsided by its composite nature. Also has reinsurance.
Risk transfer mechanism:	Risk is transferred via spreading across all risks in the bundled system.
Penetration/ coverage of flood cover:	Quite high – Considered to be around 80 to 90%.
Presence of state aid or compensation:	None – only the state guaranteed first loss cover for earthquakes as described in the sections above.
Summary:	Recovery from flooding to dwellings is entirely based upon the purchase of insurance from the private insurance market.
Key principles of the recovery system	
Efficiency:	The insurance industry exerts pressure on the government to better manage flood risk. However, currently the industry is not very involved in flood mitigation and the low premiums mean that is difficult to incentivise mitigation.
Equity principle:	*Solidaristic, risk-insensitive* insurance but there is a move towards greater consideration of the risk and for higher premiums to be introduced and therefore a move towards *individualist, risk-sensitive* insurance.
Robustness of recovery system:	*Medium* –also a higher awareness by insurers of the loss potential due to flooding. There is also the added complication of the dynamism of the risk due to the potential for earth movements to raise or lower land and thereby make them more or less vulnerable to flooding

5.4 The special case of flood insurance provision for residents in retirement villages

Currently, only a small percentage of New Zealand's older citizens reside in retirement villages; although this continues to be a growing sector. In mid-2013 the Retirement Villages Association (RVA) reports that there were 26,700 older people living in approximately 23,600 units in around 350 registered retirement villages. A number of these villages were badly impacted by the Canterbury earthquakes and there are a number of lessons that can be learnt moving forward about these groups, their needs and their specific insurance requirements.

Although some regulatory protection exits, there is some concern that some aspects are not being properly and fully enforced and that they could be much more vigilance. The role of Statutory Supervisor (SS) is usually performed by a specialist company who are licensed to act in that capacity by the Financial Markets Authority. The role of the Statutory Supervisor is important to the resilience of villages on a number of grounds. They can step in and take action if they are concerned about the financial stability of a village. The role of Statutory Supervisors in the insurance of retirement villages is discussed below in Section 5.4.1. Furthermore, if a Supervisor works proactively then they have an increased potential to increase the resilience of older people living in retirement villages (see Section 7.3.8).

Since 2007, the Retirement Villages Act 2003 [27] (as amended) it has been a requirement for all residents entering retirement villages to receive independent legal advice before signing the occupation right agreement and that a lawyer must explain to the potential resident the terms of the agreement and its implications and that the explanation

Key features of retirement villages in New Zealand

- The majority of the villages (c. 80%) operate on the status of owner purchasing a "License to Occupy" a retirement dwelling. This means that the resident does not own the property but enters into a contract with the village operator to reside in a property. On leaving the property (e.g. moving to another property, in with relatives, into a nursing home or passing away) the resident (or their estate) will only get back a proportion (usually 70% or 80%) of the purchase price. The other 20-30% is called the Deferred Management Fee and is retained by the village operator to refurbish the property to a standard ready for resale.
- Additionally, the business model generally means that the operator also gains any increase in the market value or conversely also bears any depreciation.
- Residents are only responsible for the contents of their dwelling; insurance for the dwellings is the responsibility of the retirement village operator.
- The other 20% of villages are operated on the basis of a 'unit title' or other form of tenure (e.g. rental) whereby the resident owns the property and are thereby responsible for the maintenance and upkeep. Under this regime, the operator owns the land and is responsible for the community facilities and well as the roads, drainage and services.
- Retirement villages are part of a regulated industry: with a whole suite of legislation. Most importantly the Retirement Village Act 2003 and the Retirement Villages Amendment Act 2007. Regulations are in place to protect the interests of residents including their right to live in a village. There is also a disputes process which exists to assist residents.
- Under the Act the villages are required to be registered and all registered villages are required to be signed up to the Retirement Villages Code of Practice (COP) (NZ Ministry of Business, Innovation and Employment, 2008)
- Each village is also required to be overseen by an Independent Statutory Supervisor which looks to protect the interests of the residents.

[27] Retirement Villages Act 2003 as amended by the Retirement Villages Act 2007.

"be given in a manner and in language that is appropriate to the age and understanding of the intending resident[28]".

This legal disclosure, although does not guarantee that the resident will heed their advice, does provide a mechanism in place to ensure that residents who entered the village post-2007 have had the agreements explained and should be aware of the occupancy details, a part of which is likely to include what insurance issues are their responsibility and which are the responsibility of the village operator. Awareness of these issues may diminish the longer a resident lives in a village as there is no requirement for these terms and conditions to be revisited and of course understanding may be lower for those who entered a village before 2007. Indeed, there is some evidence to suggest that following the Canterbury earthquakes some residents thought they were covered as part of their contract when in fact they were not.

5.4.1 Insurance in retirement villages

When residents reside in a village under the terms of a unit title, a resident will be responsible for the insurance of both the property and the contents: in the same way that they would be responsible if they owned their own property that was not located within a retirement village. The rest of this section will therefore primarily focus on insurance issues to those living in villages with a 'license to occupy' model.

In these villages, the village operators are responsible for insuring the physical assets of the villages (including the individual residents' units) under a commercial model of insurance. The Retirement Villages Code of Practice (COP) since 2013 specifies the details of the coverage and that they are to have comprehensive insurance coverage for full-replacement cover. Additionally, village owners may take out temporary accommodation insurance and business disruption insurance. The COP also makes the requirement that this coverage must be to the satisfaction of the SS who check a range of different features of retirement villages. The SS is required to report to the Registrar of Retirement Villages that they are satisfied with the running of the village.

Obtaining an appropriate level of insurance may be a complicated process now that insurance is for a nominated sum, but in general the process will require proper evaluation. Valuations are required to be undertaken; these must be current and should include everything above and below the ground (e.g. sewerage pipework, communication and power lines etc.). However, some SS are not yet fully qualified to be able to suggest the insurance coverage is adequate although this is improving with additional training being offered to supervisors, although they should continue to rely heavily upon the knowledge of specialised professions such as insurance brokers and valuers. It is expected that in the future SS will be more able to adequately judge the appropriateness of retirement village insurance and will be able to intervene if not satisfied; thereby increasing the resilience of these villages to natural events. However, the SS is employed by the village operator and although many are reputable there is no guarantee of their impartiality and few guidelines about their powers and responsibilities in relation to many of the issues around adverse natural events.

Contents insurance in this scenario is solely between the individual resident and their insurer. There is no obligation for a resident to have contents insurance and some have chosen not to insure. This could of course be for a number of reasons which may include the price of the cover and whether they consider the value of their possessions is worth insuring. Many residents however will just transfer the type of insurance that they have always had. However, there are a number of specialist products available to residents in retirement villages which offer an appropriate level of cover and may also include temporary accommodation cover if for whatever reason they are unable to reside in their property (i.e. the village is closed due to fire or a natural event).

5.4.2 Lessons for retirement villages and retirement village insurance from the Canterbury Earthquakes

A number of villages were badly impacted by the Canterbury earthquakes and many of the difficulties that were experienced have led to some potential lessons for the provision of flood insurance and the resilience of residents in retirement villages. The extent of the damages to villages was unprecedented and whereas

[28] Ibid, Section 27(6)

Experiences and lessons for retirement villages from the Canterbury earthquakes

- Four villages were very badly damaged; two were rebuilt and two have not been.
- One village was not able to be rebuilt because it was located in an area re-designated as a red zone, whereas one operator decided not to rebuild.
- 80% of villages in the affected areas had some level of damage – but in most cases residents were able to continue to live in the damaged properties (sometimes with temporary repair) until they were able to be fully restored.
- Practical issues involved finding temporary accommodation very quickly for large numbers of residents when many others also looking for alternative accommodation.
- Many owners did not have adequate temporary accommodation insurance, as some people required accommodation for up to two years: new insurance products have now emerged to fill this gap.

Financial issues

- Difficulties experienced by one of the destroyed villages, whereby the land was badly damaged and subsequently red zoned, but the properties were largely undamaged. Therefore, the insurer originally refused to pay out as there was essentially no damage to repair; yet the operator could not continue to run the village. Eventually, a settlement was reached between the insurer and the operator.
- Uncertainties about the residents' level of pay-out when a village was destroyed and not rebuilt.
- Under the contracts residents were only entitled to the original purchase price of the property minus the Deferred Management Fee, even though it was not their choice to leave the village – this meant that some found it difficult to relocate.
- Insurance claims took a long time to settle due to the large amounts involved (in the order of NZ$50million in some cases and therefore the insurers had to fully investigate claims. This meant that both village operators and residents had to wait a considerable period for their pay-outs.

Industry response

- Positive and coordinated response of the industry who worked together to find temporary accommodation and new permanent units for displaced residents.
- Retirement village owners also in some circumstances gave affected residents extended terms of credit and special terms in order to assist them in relocating to alternative villages.

operators were used to dealing with one or two units being affected by fire, in this situation hundreds of units were impacted at the same time. Generally, the Canterbury earthquakes created a lot of difficulties, stress and frustrations for both residents and their families and operators. Not least because there were conflicting priorities: the operator having to make the decisions about the village as an entity (and whether rebuilding was a possibility) and that grated with individual residents who expected decisions to be made on an individual basis. It was a process that no-one has been through before and it was a process that exceeded the wildest expectations of anyone in terms of magnitude and severity. It highlighted the importance of effective communication between insurers, operators and residents. Changes were made to the Retirement Villages Code of Practice to remove the uncertainty about the terms villages would receive in the future following the total and permanent destruction of a village (i.e. that they would not be rebuilt). Prior to the changes residents were in the situation whereby they only received the original purchase price minus the Deferred Management Fee, and in many cases this caused hardship when securing a new 'license to occupy' agreement. Although other retirement villages offered preferential rates to many of these residents and it was believed that the majority have been satisfactorily relocated in alternative villages; this whole process was very stressful for residents and their families and it was considered to be very unfair that residents were left out of pocket through no fault of their own.

The code has therefore been changed to clarify the situation for residents and therefore if in the future a village is destroyed and not rebuilt the resident will receive at least a sum equivalent to their original purchase price. [29]If however, the village is rebuilt then residents will be able to move into a reconstructed unit and their original terms and conditions

[29] See Section 47 (2d &e) of Retirement Villages Code of Practice 2008 (Variations included October 2013)

transferred to a new contract. If the resident *chooses* not to relocate then they will only receive the original purchase price minus the Deferred Management Fee and not the full 100% value.

These circumstances would be the same if in an unlikely situation a village was to be completely destroyed by a flood and not reconstructed; however it is likely to bemire relevant for other geophysical hazards when land is rezoned and residential habitation is subsequently prohibited. Interviewees suggested that the changes to the Code have in general been warmly received by the operators as it provides a framework which was missing before. They are also aware that it might have gone further as some residents were demanding that they be entitled to recoup the full market value. However, it was unlikely that this would be implemented as it would be impossible for an operator to insure for this. Implications for making residents in retirement villages more resilient to hazards via insurance will be discussed in Section 7.3.8. Despite these changes to the Code of Practice anxiety remains amongst some residents who are concerned about the levels of insurance coverage and whether their home (and investments) is secure if impacted by adverse natural events.

Both of these scenarios are now discussed and compared and contrasted to other international examples. For shorthand purposes the flood insurance cover provided for land as part of the EQC will be referred to as New Zealand (EQCover) or NZ EQC and offered by the private market for flood-affected dwellings will be referred to as New Zealand (dwellings) or NZ dwellings.

6 Models of flood recovery, insurance and compensation

How flood insurance provision is structured, what losses are covered or excluded and how it is purchased all impact upon the effectiveness of the scheme for recovering from flood losses and ultimately how burden sharing is split between the at-risk individual and society. As described in Section 4 each of international systems of recovery from flood losses have been assessed according to the three main principles:

- Efficiency - The impact that the system has upon incentivising mitigation
- Equity - The principles of social justice and fairness are upheld by the system
- Robustness - The degree to which the insurance system (and more broadly the recovery system) adheres to the principles of insurance and is therefore has economic viability over the long term.

In addition, each of the scheme's key characteristics have also been identified and presented at the end of each country's sub-section (Appendix A). This section draws together the information about the different recovery systems, and aims to provide a synthesis of the different potential options for recovery and how they reflect each of the three analysis principles above. Sub-sections introduce and compare the different types of flood insurance systems adopted internationally; the balance between the use of insurance and compensation; equity and fairness; robustness and assessments of the efficiency of different types of flood recovery systems.

6.1 Comparing international models of flood recovery

A number of studies have aimed to model and categorise flood recovery, insurance and compensation mechanisms (notably Hausmann (1998), Arnell (2000), Porrini and Schwarze (2014) and Mehlhorn and Hausmann (2012)). Each of these different approaches have focussed on different elements and are discussed below; the analysis initially focusing on different approaches to providing flood insurance cover, before broadening the discussion to encompass the role of compensation in the recovery from flood events and the involvement of governments.

6.1.1 Approaches to the provision of flood insurance cover

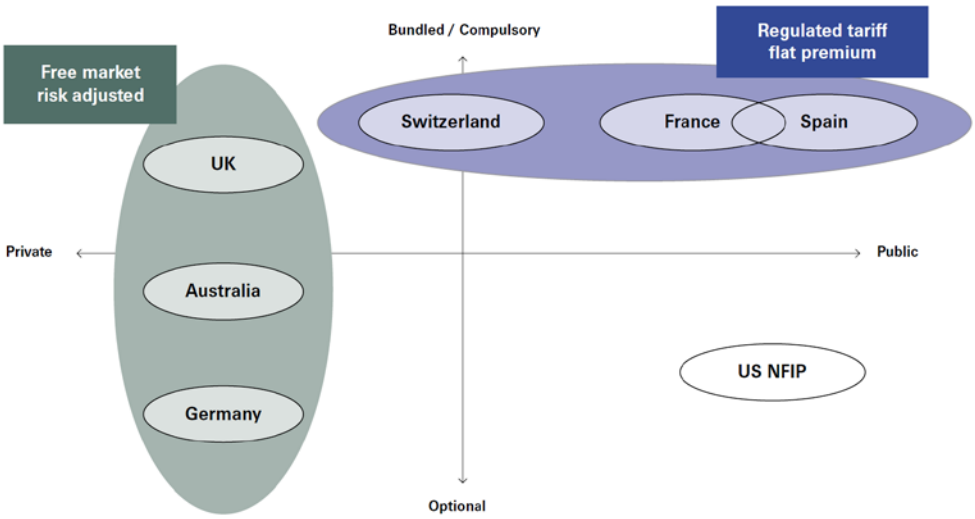
Hausmann (1998) presents a comparison based on different flood insurance solutions in relation to the following three elements; the risk of anti-selection, the loss potential and the costs of risk assessment (Table 6.1). All of these three elements focus clearly on the market viability of the insurance system. This is a good simple way in which to describe different approaches, however it lacks clarity and distinction about who bears the high loss potential (although this can be inferred).

Table 6.1: Hausmann's (1998) classification of different insurance solutions

Insurance solution	Risk of antiselection	Loss potential	Cost of risk assessment
Facultative individual cover (eg industrial property, Italy)	high	medium	high
Facultative package solutions (eg residential property, Germany)	medium	medium	medium
Compulsory package with fire cover (eg UK)	low	high	low
Compulsory state solutions (eg France)	low	high	low
Facultative cover with low limit (eg Austria)	high	low	medium
Compulsory cover with graduated premiums and deductible	low	medium	low

Source: Hausmann (1998; 35).

Figure 6.1: Mehlhorn and Hausmann (2012)'s depiction of flood insurance systems



Source: Mehlhorn and Hausmann (2012; 17).

The classification also only includes flood insurance instruments and does not account for the presence or impact of compensation mechanisms. It does however provide a first categorisation of insurance options. This has been simplified even further by Mehlhorn and Hausmann (2012) who indicate that flood insurance can be categorised into four different approaches;

- Public and optional (e.g., United States);
- Public and bundled (e.g., France; NZ (EQC));
- Private and optional (e.g., Germany); and
- Private and bundled (e.g., UK; NZ dwellings).

They go on to present these along a spectrum with two axes; whether they are public or private and whether they are optional or bundled/compulsory (Table 6.1).

This approach does illustrate a number of the key elements of flood insurance that are available; but again excludes other mechanisms of recovery such as compensation. Additionally, although its simplification is necessary from a categorisation perspective, the approach is not able to depict the inherent complexity. For instance, it highlights in the top left of the diagram a free-market and risk-adjusted situation; however often in reality a free market will also bring competition. Despite it being true that there is the freedom for flood insurance to be provided on an actuarial basis, and via risk-adjusted premiums, in reality competition within that market may often prevent this from occurring.

6.1.1.1 Bundled versus single risk insurance

A common descriptor used by a number of studies is the contrast between policies for single perils (i.e. insurance just for flooding) and those where insurance is offered as part of a bundled policy (Paklina, 2003; Sandink et al., 2010). To be economically viable single policy flood insurance will need to be provided on an actuarially sound basis; i.e. where the premiums are reflective of the risks being insured. Although this will mean that policyholders will become more aware of the risks that they face and therefore mitigation may be incentivised, there are often a number of problems associated with insurance policies which are implemented on these terms. These include:

- **Risk assessment** – insurers need to be able to effective assess and understand the risks and this was considered to be a problem in many of the international examples.
- **Availability** - insurers may choose not to provide insurance for those locations where the risk is too high – thereby arguably those who have the greatest need for insurance are not able to purchase it.
- **Affordability** – those at high risk may have insurance premiums which are too expensive and therefore they are unable to purchased insurance.
- **Adverse-selection** – if the risks are well-known there is a high possibility that only those at risk will choose to purchase flood insurance.

Bundled policies (as described in Section 2.2.2) eliminate many of these issues by enabling the flood risk to be spread more widely. These types of composite policies (such as NZ dwellings) were widespread in the international examples explored; with 17 systems whereby flood is offered via the private market having some element of bundling and with a further five pool or state-run systems also having bundling. The type of bundling did however differ with some flood insurance being solely bundled with other natural perils and others bundling flood insurance into a standard household policy along with non-natural events such as fire and theft.

There are arguments for and against both of these different types of policies and the advantages and limitations are well known. Paklina (2003) argues that the benefits of a bundled policy outweigh those of single-risks and that flood insurance should be provided in this way. The main benefit is that in those countries where flood insurance is provided as part of a composite policy insurance penetration is much higher than those where a single risk policy is offered. Crichton (2008) highlight that bundled policies permit the risks to be spread in three ways: over different risk areas, over time and between risks. These different elements permit a more economically viable system to be created. Sandink et al. (2010) also argues that the changing nature of definitions of flooding in insurance policies (i.e. the increased focus on extreme rainfall and surface water events particularly in urban areas) means that the number of properties considered to be at risk of flooding is growing; albeit with potentially lower losses than those at high risk from fluvial or tidal flooding. Therefore, although those at low flood risks are cross-subsidising those at higher risk, with extreme rainfall events covered, most homeowners "who purchases flood insurance (now) have the potential to benefit from flood coverage" (Sandink et al., 2010; 42).

6.1.1.2 The importance of the compulsory nature of insurance

The compulsory or optional nature of flood insurance is another of the key characteristics of a policy and is also obviously highly correlated to market penetration and the uptake of insurance. When defining and categorising approaches to flood insurance as well as a distinction between whether a policy is for a single risk or bundled perils the type of approach is also complicated by the optional or compulsory nature of the insurance provided. This phenomenon is also highlighted in Figure 6.1whereby one axes runs between option and bundled/compulsory.

The mandatory nature of insurance schemes may however encompass three different elements:

1. There is a requirement on property-owners to have insurance cover for flooding (and usually other natural perils)
2. Whether there is a compulsion enshrined in law for insurers to include flood insurance as a mandatory peril within any household policy;
3. Whether flood insurance cover has traditionally been included as a standard peril included within any household insurance policy.

The international examples reviewed are mapped onto these two different elements of compulsion in Table 6.2. This indicates that there is a relatively even spread in the ways in which approaches have included a mandatory element into their coverage; from trying to enforce compliance from all property-owners (and in the case of France also for tenants) to only making it a compulsory peril within standard household policies.

Porrini and Schwarze (2014) suggest that all of these situations should be considered to be compulsory as in all of them a consumer is not able to negotiate freely about those risks which are able to be insured. However, they argue that in all but the first condition, ultimately the sovereignty of the consumer is maintained as policyholders may choose not to enter into an insurance contract. This autonomy for buildings insurance may be removed however when a property owner has a mortgage (see below). Lamond and Penning-Rowsell (2011) affirm that coverage is strongest in those markets where flood is bundled into standard property insurance and weakest when a stand-alone policy is offered on an optional basis. Increased penetration coverage is not only an indicator of the potential robustness of a scheme but also as the CEBR (2012) contend that the overall costs to the taxpayer are substantially reduced when insurance penetration is highest.

Table 6.2: Elements of compulsion within the provision of flood insurance

Type of compulsion	International examples
There is a requirement on property-owners to have coverage for flooding (and usually other natural perils)	France, Iceland, Romania, Spain
There is a compulsion enshrined in law for insurers to include flood insurance as a mandatory peril within any household policy	Belgium, Denmark, Norway, Switzerland (Cantonal)
Flood insurance cover is a standard peril included within any household policy	United Kingdom, The Netherlands, Switzerland (GUSTAVO), New Zealand (dwellings)

Kunreuther (1996) highlights a number of key factors which influence whether a policyholder selects to purchase or maintain insurance (such as the importance of the perceived risk, the cancellation of policies if a claim is not made and awareness of the product). These are added to by Seifert et al. (2013) who suggest that the characteristics of the flood risk, the availability of other types of financial assistance and previous experiences of flood risk all connect and influence insurance demand and the likelihood of a policyholder to purchase insurance in situations where it is not compulsory. Indeed, Hung (2009) also suggests that homeowners often lack the cognitive ability to assess both the potential loss and the probability of a catastrophe and therefore it is difficult for many people to judge whether or not it is in their interests to insure. All of these difficulties are overcome if there is some element of compulsion in the nature of the insurance provision.

There is of course a third element of a compulsory nature that needs to be considered that there may be other conditions whereby having household insurance may be compulsory. The most common of these is when there is a loan secured on a property and the mortgage lender requires that their investment is protected. This is true of many countries (including New Zealand) that have been included in this review. However, in general this requirement only concerns a householder having a standard household policy and therefore if flood insurance is included within a standard policy then the compulsory requirement extends to include this (and often other natural perils). Secondly, there is often only the requirement to insure the building or structure under these requirements, the decision about whether to insure the contents remains the choice of the property owner.

In some circumstances (e.g. NFIP in the US) there is a requirement to have additional coverage for flood insurance. For instance, in the case of the NFIP if a property is located in a Special Flood Hazard Areas and have Federal mortgages then they also are required to participate in the Program. Although this compulsion will have a positive impact upon penetration and makes it more likely that policyholders will have insurance, it does not guarantee that all those who have a mortgage loan will also have purchased insurance. This will often depend upon how stringent mortgage lenders are in regulating and checking that insurance has been purchased and the terms of that coverage. Dixon et al. (2006) investigated the market penetration of the NFIP and as part of this the numbers of policyholders complying with mandatory purchase requirements. It has been estimated that 50% to 60% of properties in SFHAs are subject to the mandatory requirement; however they estimate that compliance with these requirements appears to be only 75% to 80% and therefore there are quite a few households who do not have flood insurance than should have (Dixon et al., 2006). However despite this, penetration rates are still much higher for those who have mortgages than do not have the requirement and it is suggested that market penetration is a low as 20% for those where flood insurance is not mandatorily required.

6.1.1.3 Different premium mechanisms

One of the other key elements is how premiums are collected and used to distribute and transfer the risk. The different types of premiums are of course related to the type of insurance provided. The main distinction is between flood insurance cover which is priced according to the risk and whether a full actuarial premium is charged, or whether a below risk-priced premium is charged;

whether this is subsidised or purely market driven. Although in theory a full-actuarial premium might on the face of it appear to be the ideal situation in reality; in practice there are very many barriers to the adoption of this approach; not least affordability and availability issues. Therefore, examples of full risk-related premiums amongst the international examples are limited and in particular the New Zealand dwellings insurance premiums are not differentiated by flood risk.

A single-risk policy is of course (at least in part) actuarially calculated and therefore reflective of the flood risk of the property being insured. Machetti (2009) suggests that there are three other types of price forms which are independent of the actuarial level of the premiums and the degree to which they are risk differentiated. All of these were present in systems investigated in this study; these are:

- A fixed amount – this might also be known as a flat-rate premium which is applied (such as that applied in Denmark, Taiwan)
- *As a percentage amount of the base policy* (e.g. France)
- As a percentage of the insured capital (e.g. Norway, New Zealand EQCover, Japan, Spain, Iceland, Portugal, Netherlands, Switzerland (GUSTAVO))

All of these premium mechanisms might be used for the provision of flood insurance and are employed within private-bundled or pooled policies and they might be considered to be additional premium enforcements or a levy. Although in essence to a policyholder who is bearing the cost these might be considered to be similar and generate additional funds from which to pay claims, the way in which they are held and transferred (e.g. to an insurance company, in an insurance or state-run pool or reinsurance reserve fund) may vary considerably. The nature of the instrument (additional premium or levy) may also vary in terms of how they are treated and handled in law (i.e. are they considered to be a tax, as public or private funds).

In addition to these actuarial or non-actuarially based mechanisms there may also be other situations whereby although there is the potential to implement pricing on an actuarial basis, the competitiveness of the market is inhibiting this process. This is the circumstances are present in the Netherlands with rainfall-based flood insurance and in the UK for flood insurance. In these situations, the flood risk component of the risk ends up being under-priced. In addition, the composite nature of the policy means that the policyholder has no way of knowing how much each of the different elements combines to make up their overall premium. Although this in itself is not necessarily problematic incentivising mitigation action to reduce risk may be challenging under these conditions (see Section 6.4).

As well as different ways in which premiums are priced there were different approaches to the setting of deductibles. The majority of the international examples studies employed deductibles which is the amount a policyholder is required to pay and is therefore the proportion of the financial losses that they have to bear. Some deductibles were set at a fixed value for all of those affected, some were graduated according the risk and others were employed as a percentage of the total loss. Whatever approach was adopted there was usually a minimum deductible to be applied. Increasing deductibles may be seen by insurers as an alternative (as well as a complement) to raising premiums; the attractiveness being that it will have the effective of reducing the overall exposure of an insurer (as the proportion of the total risk they will bear is lowered) whilst still maintain the affordability of premiums, at least in the short term. Machetti (2009) also argues that where risks are very high the employment of deductibles is required and fundamental to maintaining the insurability of cover; and should be employed in conjunction with risk-reflective pricing. Therefore, gaining an effective balance between the overall pricing of the risk via premiums and via deductibles can be an effective way in which to manage the economic viability of an insurance product. In New Zealand fixed deductibles are employed by the EQCover; whereas for private cover the presence (and amount) of a deductible for flooding can vary depending upon the specific terms of the policy.

6.1.1.4 The robustness of different flood insurance approaches

Table 6.3 provides a simplified approach to presenting the different models of flood insurance provision. As discussed above there are many different ways in which the approaches can be categorised. The approach adopted here focuses on the robustness of the approach and its

economic viability and builds on some of those discussed above as well as others (Hausmann, 1998, Arnell, 2000, Priest, 2003; Porrini and Schwarze, 2014; see Table 6.6 below). In particular, the categorisation incorporates Hausmann's (1998) three threats to the insurability of flooding; the risks of anti-selection, the loss potential to insurers and the costs of assessment.

Each of the different international models of insurance has been placed in the table along with the different threats to insurability as indicated by Hausmann (1998). Where more than one system of insurance is present within any one country these countries appear more than once in the table.

Table 6.3 provides an initial review of the robustness of an insurance system based on the three threats to insurability. The least viable approach appears to be one whereby cover is **optional** and sold as a **single policy** as this had a high score for all three of the 'threats'. This type of system is generally evidenced by low penetration (e.g. Germany, Italy, Indonesia and Taiwan) as premiums are relatively expensive and therefore discourage or prohibit uptake. In the US where this approach is also adopted high premiums are off-set by government subsidies making participation in the program more affordable. Can this approach be considered economically viable when in 2008 it was reported to be in debt to the US Treasury in the order of US$ 17 billion?

From this analysis, the most viable and robust option appears to be the final one in the table where insurance coverage is **compulsory** and provided with **graduated premiums**. It scores low or medium on all of the threat criteria and in particular for the two greatest threats to insurability; the risk of anti-selection and the loss potential to insurers. This of course makes sense from a viability perspective as not only will a compulsory scheme have a sufficiently large pool of policyholders from which to draw equally the presence of graduated premiums makes it more likely that insurers able to obtain sufficient funds to cover claims. However, despite this approach being the most robust there are no current international examples of where it has been adopted.

There could be many reasons why an approach of this nature has not been utilised and the reasons may vary between countries; however the compulsory nature of this approach may be at least part of the answer. This element of the scheme is likely to require legislation (and therefore government involvement) in order to mandate policyholders to adopt insurance. This coupled with graduated (and therefore potentially risk-reflective premiums) means that some homeowners will be compelled to take out insurance which for some may be quite expensive and to some unaffordable. Irrespective of the cost, many policyholders will have an increased expense and also lose the autonomy to make decisions about insurance purchase. A government is likely to find that any move towards encouraging a system of the nature is likely to be both publically and politically unpopular and therefore may be reluctant to advocate its introduction; without government regulation however a system is unlikely to be feasible. The closest international examples to this approach are those adopted in France, Iceland, Romania and Spain whereby cover is compulsory; however the premiums in these cases are not graduated.

The proposed UK model (for adoption post-2015) is however moving towards an approach where flood cover will remain a standard part of a household policy; thereby fulfilling the compulsory element. Additionally, premiums are set to become more graduated and risk reflective, particularly in the moderate and high flood risk areas. The issues of affordability in this case are overcome by the establishment of an insurance pool and the capping of premiums for the very highest-risk properties. Additionally, Defra (2013a) indicate that this proposal is only an interim transitional measure established for the next 20 to 25 years; after this period they expect premiums to be fully-risk related with no subsidisation and therefore a system based on compulsory cover with a graduated premium is expected to be adopted.

Table 6.3: Models of flood insurance provision

Description	International examples	Threats to insurability		
		Risks of anti-selection	Loss potential to insurers	Cost of assessment
Flood cover included as a standard part of a domestic household policy	Netherlands (rainfall and SWF) Switzerland (GUSTAVO) United Kingdom (pre-2015) Belgium New Zealand (dwelling)	Low	High	Low
Flood cover available as an optional extra to a fire policy – bundled with other perils	Portugal Sweden Brazil Ecuador China Israel Japan Philippines Germany Argentina Australia Austria Mexico	High	High	Low
Flood cover provided by a compulsory levy on insurance premiums **(a) Levy goes to a pool of private-sector companies**	Norway Romania United Kingdom (post-2015)	Low	High	Low
(b) Levy goes to a government-supported agency (often state-guaranteed)	France Denmark (sea flooding) Iceland Spain Switzerland (Cantonal) New Zealand (EQC)	Low	High	Low
Optional flood cover sold as a separate single risk policy	Germany Italy Australia Indonesia Taiwan United States[30]	High	High	High
Compulsory cover with a graduated premium	This is currently not a utilised model	Low	Medium	Medium
Flood cover not available (or minimum availability)	Netherlands (sea and river) Canada (most flooding)	n/a	n/a	n/a

After (Arnell, 2000; 419; Hausmann, 1998; 35 and Priest, 2003; 223).

[30]Although a separate policy is provided - the terms of the US insurance system are very different from the others in this category which are all provided as part of the private market. As well as the US approach offering a state-funded solution, premiums are subsidised which makes the insurance affordable and uptake more widespread.

From an economic viability perspective there appears, in principle at least, to be little difference between many of the other approaches; in particular when they also have an associated degree of compulsion. Both a pool-based approaches and those where flooding is included as part of a standard household policy encourage economic robustness via the grouping of the risks and spreading the potential losses as widely as possible. Further discussion about the techniques that different approaches to flood recovery use to spread and transfer risk thereby increasing economic viability are is presented in Section 6.2. However, the full robustness of each of these schemes is only apparent when specifically comparing the premiums that are charged, the numbers of people participating in the approach and a full assessment of the flood risk.

The categorisation adopted above in Table 6.3 is a good way of presenting each of the insurance approaches and permits a good initial analysis of the robustness and viability each schemes; but it is lacking in the degree to which the approach is provided by the private market or has state intervention. Botzen and van den Bergh (2008) highlight the distinction between public and private coverage in arrangements to recover from flood damages.

Table 6.4: Characteristics of arrangements against flood damage

Kind of Arrangement	The Netherlands	The United Kingdom	France	Germany
Private coverage available	No	Yes	Yes	Yes
Premium differentiation	NA[a]	Yes	No	Yes
Public reinsurance	NA[a]	No	Yes	No
Public compensation scheme[b]	Yes	No	No[c]	Yes

[a]Not applicable because private coverage is not generally available.
[b]Does not involve a right to compensation.
[c]Evidently, the public reinsurance scheme is (partly) financed through taxes.

Botzen and van den Bergh (2008; 423)

However, as Botzen and van den Bergh (2008) it is impossible to investigate the role of state intervention without including the presence or absence of public compensation. The following section will therefore focus on the balance between compensation and insurance in the recovery from flooding.

6.1.2 The balance between insurance and compensation in flood recovery

The private market is often seen as the most effective and most efficient way in which to provide insurance and recovery from flooding and other natural perils (Botzen and van den Bergh, 2008). However, many of the countries examined as part of this study had compensation funds in place to assist in the financial recovery of individuals from flooding. Michel-Kerjan (2001) argues that there are two primary strengths of government intervention and compensation funds in post-disaster recovery:

- Governments are able to spread the costs over time (i.e. this may even include risk-spreading over a number of generations)
- Obtain compensation from a very large number of people (i.e. the whole taxpaying population)

Table 6.5 presents the international examples investigated in relation to the insurance system they have adopted as well as whether they have a compensation scheme in place. The flood insurance strategies adopted in this table differ slightly to the categorisation adopted above in Table 6.3. This was necessary to distinguish between those strategies which utilise the private market or public-based solutions.

From examination of the international strategies for recovery, there does appear to be some relationship between flood insurance availability and penetration and the compensation available. Those governments of countries with little or no flood insurance in general appear to have made greater preparations for the payment of compensation. However, many countries have a system whereby both insurance and compensation are available. In some countries (e.g. The Netherlands) this may be because some types of

flooding are covered by insurance and others are not. However, in many situations the availability of State financial aid and compensation is obstructing the development of a functioning private market of flood insurance and contributing to low flood insurance penetration. Faure (2004; 5) argues that approaches to the compensation for disasters in Europe are diverging. Four different perspectives of compensation funds are presented in Table 6.5:

- Systems with no state compensation provided
- Systems where compensation is provided on an ad-hoc basis (often when legislation is implemented ex-post when there is hardship)
- Systems where compensation is enshrined in legislation or policy and provided and financed by ex-post funds
- System where compensation is enshrined in legislation or policy and provided and financed by ex-ante funds

It is important to stress the difference between the more formal state compensation schemes (e.g. Austria, Mexico) which have defined those natural perils which are included, have clear procedures in place and have a formalised mechanism for claiming assistance; and those where emergency legislation ex post is introduced on a case-by-case basis following a disaster (e.g. Germany, Australia, Italy). Although in many cases individuals may be compensated in similar ways, expectations of the State may differ considerable and there will be less certainty about whether victims will receive any financial assistance. Depending on the general culture of State intervention in the country of interest, this uncertainty may be more acceptable to some property-owners than other. For instance, those with a strong tradition of State assistance (e.g. Italy) will come to expect such assistance and is unlikely to have a strong impact. However, in other nations this uncertainty may have the positive impact of encouraging households to take out cover. However, it does raises questions of social justice and the fairness of the approach.

There is also a difference between those recovery systems which are financed in advance of flooding (or other natural events) (e.g. Austria) and those where funds are collected ex-post. GFDRR (2011b) argues that the former allows a greater degree of planning and financial preparation than those which are required to raise funds after flooding. The arguments between structural versus ad hoc solutions is complex. Faure (2004) contends that on the one side there is the argument that a structured approach whereby victims are confident that they will get some compensation following flooding sends the wrong signal and is potentially detrimental to the uptake of household financial solutions (i.e. insurance, self-insurance) or preventive measures. However, on the other hand there is an argument that ad hoc compensation creates "legal uncertainty" (Faure, 2004; 21) with the potential for different terms and conditions and amounts of compensation to be provided after different events. It also prevents governments from developing adequate reserves between years in order to be able to spread the risks most widely. Schrader (2012: 4) summarises both the problems of ex-post financing and the advantages of ex-ante financing:

Problems of ex-post financing
▪ Limited borrowing capacity ▪ Narrowing tax-base for internal resource mobilisation ▪ Slow pace of external support
Important advantages of ex-ante financing
▪ Tailored combination of risk retention and transfer ▪ Positive spill over on disaster management ▪ Better economic management, more reliable (and targeted) government intervention Contribution to financial sector development

At the highest level a State-funded compensation scheme is an example of a national solidarity approach; whereby all citizens will ultimately contribute to the scheme. However, an issue of fairness is raised when some citizens are choosing to take precautions from flooding and paying a premium for flooding for which they will receive recompense and others who do not receiving a similar level of financial assistance. There is much to be said of the French State-backed insurance system of which one of the founding principles is that all victims should be treated equally.

Table 6.5: The presence of compensation and insurance within international flood recovery systems

APPROACHES TO INSURANCE		APPROACHES TO COMPENSATION: No state compensation provided[31]	Ad hoc compensation (i.e. only implemented in legislation or provided at the time of event)	Ex-post compensation (i.e. schemes are enshrined in legislation/policy but no fund established prior to event)	Ex-ante compensation (i.e. schemes enshrined in legislation and fund established prior to event permitting a reserve)
No (little) flood insurance available				Netherlands (sea and river)[32] Canada (most flooding)	
Insurance provided via the private market	**Optional[33] individual flood cover (risk-reflective)**	Indonesia*[34] Taiwan	Germany Italy Australia Poland		
	Optional composite cover (bundled with other perils)	Portugal* Sweden Brazil Ecuador China*[34] Israel Japan* Philippines*	Germany Argentina Australia		Austria Mexico[35]
	Compulsory inclusion of cover in a package	Netherlands (rainfall and SWF) Switzerland (GUSTAVO) United Kingdom (pre-2015) New Zealand (dwellings)			
Pooled flood insurance[36] (with no state guarantee)		Norway Romania* United Kingdom (post 2015)			
Pooled flood[16] insurance (has a state guarantee)		France Denmark (sea flooding) Iceland[37]			Belgium[38]
State-run[16] (and subsidised) flood insurance scheme		Spain[39] Switzerland (Cantonal)	United States		

[31] Where it is unknown whether a country has state compensation - these have been categorised in this category but signified by *
[32] There is one policy available for flooding but premiums are high and uptake is limited.
[33] Whether optional or compulsory relates to whether there is a *choice* whether cover for flooding can be purchased or excluded from a household policy
[34] Some insurance is provided by state insurers but it appears that it is not subsidised.
[35] But compensation to private households is limited to low income housing.
[36] These strategies may also have some private market involvement, however insurance is not solely provided on this basis.
[37] Other flood insurance is available via the private market, however terms vary.
[38] Although there are ex ante schemes established in reality the financing is provided both *ex ante* and *ex post* (i.e. the fund is topped up if funds prove to be inadequate).
[39] Although there is some insurance underwritten by the private market so that it could be considered to be a pooled-type system with a state guarantee.

Porrini and Schwarze (2014) have an interesting view of compensation schemes and argue that they are an example of "enforced solidarity". They suggest that taxpayers are obligated to contribute and that when payments are received following flood losses the monies accepted are not a service in return but are a "relief measure provided upon 'request' of the claimant" Porrini and Schwarze (2014; 12). As a result of examining how insurance can be used as a system for managing climate change they present five stylised models of insurance (and other recovery including compensation) for managing the risks of climate change in Europe. These models are described in Table 6.6 and adapted to try to develop the models solely for flood insurance. Examples of international flood insurance schemes have also been added. Porrini and Schwarze (2014) go on to analyse each of the models according to the four criteria which each can provide some indication of the robustness of the recovery approach. These criteria are:

1. Avoiding adverse selection – avoiding the situation whereby those only at high risk purchase insurance and narrow the pool. "Adverse selection means that poor quality risks squeeze good quality risks out of the pool."
2. Avoiding moral hazard – when knowing that they will receive money to compensate them reduces a victim's incentive to reduce damages.
3. Avoiding charity hazard – the presence of government and/or private assistance after losses reduces any incentives to take action.
4. Avoiding transaction costs – high transaction costs involved with insurance (costs of the completion and settling claims) can threaten the economic viability of a product.

After Porrini and Schwarze (2014)

In Table 6.6, Porrini and Schwarze (2014) highlight that the schemes which are most likely to avoid the key problems related to recovery are M1, Public monopoly insurers of flooding and M2 where recovery systems operate on the basis of compulsory insurance for all. They argue that when all things are considered (as well as the potential to encourage adaptation or mitigation and the ability to manage financial risk) on balance M1 performs the highest across the board. However, M2 performs better in terms of the ability to manage risk and economic viability. Comprehensively, Porrini and Schwarze (2014) argue that model M5 (Taxpayer financed governmental relief funds) performs the worst in the majority of the categories.

This raises an important issue in relation to flood insurance and whether the actions of the state are dis-incentivising insurance uptake (Coate, 1995). This is referred to by some as 'Charity hazard' (Porrini and Schwarze, 2014). Achieving an appropriate balance between the actions of the state and the insurance industry is critical to the success of any flood insurance scheme. The presence and role of disaster assistance has often considered to be a key variable in the failure of individuals to purchase insurance; however a number of studies have refuted this finding and contend that there is little empirical evidence to support this notion (Kunreuther, 1978; Kunreuther, 1996; Thieken et al., 2006).

There are many discussions about whether disaster funds are preferable to insurance (Doherty, 1997, Richer and Nell, 2003). Schwarze and Wagner (2004) argue that disaster funds have more disadvantages than insurance-based solutions as they are less able to absorb risks than their more market-based counterparts. They also argue that with compensation schemes the risk is generally held within a country and that it is more difficult to spread those risks externally. When reinsurance is purchased as part of an insurance system this is automatically undertaken as the majority of this type of cover is international. In general, Faure (2004) argues that if insurance coverage for natural perils is available (along with adequate reinsurance) and is competitive, this spreads the risk better than compensation funds and that it better enables risk differentiation.

Table 6.6: Five stylised models of flood insurance adapted from Porrini and Schwarze (2014)

Model and description	International examples	Avoids adverse selection	Avoids moral hazard	Avoids charity hazard	Avoids transaction
M1 (Regional) public monopoly insurer of flooding These regulate the mandatory nature of insurance and in the most part are regional. Their public nature permits them also to have involvement in other areas of policy (e.g. risk reduction measures or land use measures). Monopolies in the EU are limited by competition legislation although may be permitted under the virtue that they provide a public benefit.	Switzerland (Cantonal) United States	Yes	Yes/ No	Yes	Yes/ No
M2 Compulsory insurance for flooding Insurance is mandatory by law and includes a compulsory obligation for all those potentially affected by natural hazards to purchase a policy to provide cover. It is usually combined with an obligation on insurers to prove insurance for the risks. Although there is a regulatory framework the way in which flood cover may be offered may vary due to the potential supplier competition.	France Iceland Denmark (sea flooding) Spain New Zealand (EQC)	Yes	No	Yes	No
M3 Compulsory inclusion of flood insurance into general house ownership insurance (coupling of contracts) This is usually bundled insurance coverage and involves the compulsory inclusion of natural hazards within buildings and contents insurance (e.g. usually fire). In one sense it is ultimately also a form of compulsory insurance as policyholders are not able to negotiate freely regarding which perils for which to purchase insurance. However, ultimately a policyholder may decide whether to insure at all (although there may be a compulsory element related to the conditions on mortgage loans).	Netherlands (rainfall and SWF) Switzerland United Kingdom (pre-2015) Belgium Norway Sweden New Zealand[40] (dwellings)	Yes/No	No	Yes/No	No
M4 Free market flood insurance with ad-hoc governmental relief programmes A free-market solution. Porrini and Schwarze (2014) argue that free market solutions only co-exist with ad hoc government relief programmes. Without the government relief to fill in the gaps in coverage that are created (due to affordability and availability) within a purely commercial operated system.	Austria Germany Australia Argentina Portugal Sweden Brazil Ecuador Italy China Israel Japan Philippines	No	No	Yes	No
M5 Taxpayer financed governmental relief funds These are ultimately financial arrangements funded by taxes and used to compensate for damages, usually up to a fixed amount. Payments are generally made in those cases where the claimant is not privately insured. Porrini and Schwarze (2014) argue that this is in fact 'enforced solidarity' and that the disaster fund is enforced through the obligation to pay taxes into the fund. In many of these cases supplementary comprehensive natural hazards cover is often available through voluntary private insurance; usually offered as an add-on to buildings insurance.	Austria Mexico Germany Italy Netherlands (river and sea)	Yes	No	No	No

After Porrini and Schwarze (2014, 8, 11-14).

[40] As described in the table, it is not compulsory for homeowners to have flood insurance for dwellings in New Zealand (unless they have a mortgage) however if insurance is purchased flooding is a compulsory peril and a homeowner is not free to select not to purchase cover for flooding.

Lamond and Penning-Rowsell (2011) suggest that market insurance is often more expensive than state-run approaches for a number of reasons including: marketing costs, lower portfolio diversity, increased handling costs (due to the lower economies of scale) and the need to make profit margins. They argue that a national approach will have a higher economy of scale and reduce the need to have other costs such as marketing. However, this might only be considered to be true in the situation when flood insurance is provided separately, if it is added to an existing composite household policy then these costs are not additional and would exist regardless if the cover includes flood risks or other perils (Lamond and Penning-Rowsell, 2011).

Table 6.3 and Table 6.6 provide some indication of the types of approaches to flood recovery that are more economically viable than others. Faure (2004) indicates that from an economic perspective other solutions are preferable to compensation funds; however if funds are to be used there are four economic prerequisites to be ensured:

1. **A subsidiary characteristic** – victims should be forced to use other solutions (e.g. insurance) where these are available. This means that property-owners need to investigate other solutions first. This is a situation with many of the existing funds explored in this study. However Faure (2004) goes on to argue that the mere presence of a fund disincentives insurance. Therefore, funds should only be used for those risks which are considered uninsurable.

2. **The use of subrogation** - where possible any compensation should be subrogated against potentially liable third parties. Although a victim may receive compensation from a fund without having to go through the liability system first, these losses should subsequently be recovered (where possible) from any third parties at fault.

3. **Those contributing to the risk should finance the compensation fund**. This is most difficult with natural events as there may often be no clear contributor to the risk. Faure (2004) argues that there is a distributional perspective to consider here and a political decision needs to be taken about whether those potential victims (i.e. only those at risk) contribute to the fund or a more national-solidaristic approach where all taxpayers contribute. The answer is likely to be mainly a political one, however also may depend upon the nature of the fund, as one whereby all natural risks are included may be more difficult to distribute to only those at risk.

4. **Compensation funds should not provide full coverage**. This condition will mean that victims are still partially exposed to the risks and are therefore more likely to take action to reduce losses. This may be achieved through having an upper limit on compensation or through the use of a deductible.

Although the models presented by Porrini and Schwartz (2014) are informative; the grouping of different types of insurance and handling compensation separately means that countries can appear more than once in the models and the categorisation is potentially too aggregated when looking at only one type of natural peril. Therefore, the results of the international comparison presented in Table 6.5 highlighted that the majority of countries have little compensation provided by the state. From analysing the relationships that are present between insurance and compensation eleven different types of system are identifiable. However, four of these might be considered to be those most commonly employed with two of those really dominating:

- Optional composite insurance (usually an add-on to fire policies and bundled with other natural perils) available from the private market where no compensation is provided
- Compulsory inclusion of flood insurance within standard household insurance policies where no compensation is provided (e.g. New Zealand dwellings).

Table 6.7 presents these different types of schemes and with the most dominant mechanisms for household-level recovery from flooding highlighted in bold.

Table 6.7: The eleven different types of approaches identified from the international comparative review

Insurance component	Compensation	Dominant recovery mechanism
Little flood insurance available	National compensation funds	National compensation
Optional flood cover from the private market with graduated premiums	No compensation	**Insurance** where taken up – but often penetration is low
Optional flood cover from the private market with graduated premiums	Ad hoc compensation	Penetration rates are generally low (excluding Australia) and therefore **compensation** is generally dominant
Optional composite insurance from the private market	**No compensation**	**Insurance the only option – and level of recovery depends on penetration rates which vary**
Optional composite insurance from the private market	Either ex-ante or ex-post compensation	Penetration rates are generally low (excluding Australia) and therefore **compensation** is generally dominant
Compulsory inclusion of flood insurance within standard household policies	**No compensation**	**Recovery is entirely from insurance**
Compulsory inclusion of flood insurance within standard household policies	Ex-post compensation	Insured risks are excluded from the compensation and therefore **insurance** dominates
Pooled flood insurance operated by the market	**No compensation**	**Recovery is entirely from insurance**
Pooled insurance with a state guarantee	**No compensation**	**Recovery is entirely from insurance**
State-run and subsidised insurance	No compensation	Recovery is entirely from **insurance**
State-run and subsidised insurance	Ad hoc compensation	Recovery is mostly from **insurance**

Michel-Kerjan (2001) argues that the increase in costs for governments in terms of providing compensation and aid to recovery from losses are causing some to examine more closely their indemnification, risk reduction and the availability of insurance. This may be leading to a questioning of the specific role of governments in recovery strategies.

6.1.3 The role of governments in providing recovery from flooding

The level of intervention of government is one of the defining elements of whether an insurance-based scheme or compensation-oriented flood recovery approach is adopted. As described above the role of the state varies from very little intervention (e.g. UK) to a fully state-implemented insurance scheme (e.g. USA) to recovery mainly implemented by compensation (e.g. Netherlands). However, it is important to stress that the options are not mutually exclusive. A system based on a foundation where there is an effective public-private partnership with clearly defined roles and responsibilities is likely to be one which is working well.

This role of the State is a key element discussed by Mehlhorn and Hausmann (2012) who have categorised Government involvement into four key ways (Table 6.8). They stress that in developed countries with an established and active insurance market there should be no need for a government to absorb the risks from natural events; whereas

when an active insurance market is absent governments should adopt the role of enabler.

In New Zealand councils as well as central government fulfil the first three of these roles as they set guidelines and rules about such aspects as the mitigation of flooding and spatial planning in flood risk areas as well as undertake and support flood risk research and modelling activities. Their main role is of course thorough their involvement in the provision of the EQCover and the state guarantee that they provide to that system.

Often one of the important characteristics of insurance schemes for natural hazards is the degree of public and private partnerships involvement in risk transfer. The most common element in this area in the provision of insurance for flood (and often also other natural hazards) is the presence of some type of pool or national insurance fund. Although insurance and reinsurance pools may differ in their approach and functioning.

Table 6.8: The role of governments in flood insurance

Potential role of government	Explanation
Governments as rule setters	The public sector has the political and legal power to set rules and regulations that enable the insurance market to absorb large losses. These include setting capital and licensing requirements for insurers, providing access to international markets, defining the terms of liability, supporting preventive measures, etc. In some situations, governments can help expand the availability of risk transfer solutions to individuals and corporations by introducing compulsory insurance schemes to create a sufficiently large "risk community". In many cases, the public sector and the insurance industry are implicit partners. Insurers will only insure against floods if the government implements flood prevention measures or against fire if fire brigades exist.
Governments as sponsors and facilitators of an insurance market:	Where an insurance market does not yet exist – as is often the case in developing and emerging markets (e.g. China) – governments and non-governmental organisations can play an important role in facilitating the development of risk transfer solutions. This may involve collecting exposure data and supporting risk research and modelling to enable new insurance solutions. In addition, governments can encourage the development of an insurance market by initially subsidising insurance premiums.
Governments as re/insurers:	In many countries, governments also act as insurers or reinsurers for certain risks in order to supplement private insurance schemes. Government backstop programmes can effectively facilitate a limited private-sector insurance solution wherever risk assessment is a particular challenge and where the magnitude of a potential loss exceeds the capacities of the private sector, such as in scenarios involving terrorism or extreme natural catastrophe tail risks. For most weather-related and other natural catastrophe risks, however, the private sector has the capacity and expertise to provide sufficient coverage. Here, the public sector should limit its direct involvement and focus its intervention on expanding the availability of insurance schemes – with the ultimate aim of establishing an efficient private-sector market.
Governments as re/insurance buyers:	As the private sector has the expertise and capacity to insure disaster risks, governments can also buy private insurance coverage themselves. This enables the public sector to fund disaster expenses before a catastrophe occurs.

Source: After Mehlhorn and Hausmann (2012; 22)

Boudreau (2011) highlights some common goals:

- Create an insurance mechanism that makes liquidity available to the insured affected by a natural disaster;
- Reduce the government's fiscal exposure and the risk to the national economy arising from major natural disasters;
- Ensure the financial solvency of the pool after all but the most catastrophic events;
- Reduce the government's financial dependence on donors' financial assistance in the aftermath of a major natural disaster.

She also presents an indicative diagram of the public and private partnership structure of a pool solution (Figure 6.2).Machetti (2009) also highlights the type and degree of risk transfer between those catastrophic risk insurance systems where there is public intervention; many of which include coverage for flooding. Primarily, Machetti (2009) highlights the heterogeneity that exists between systems and levels (Figure 6.3).

Figure 6.2: The role of public and private partnerships in risk insurance pools

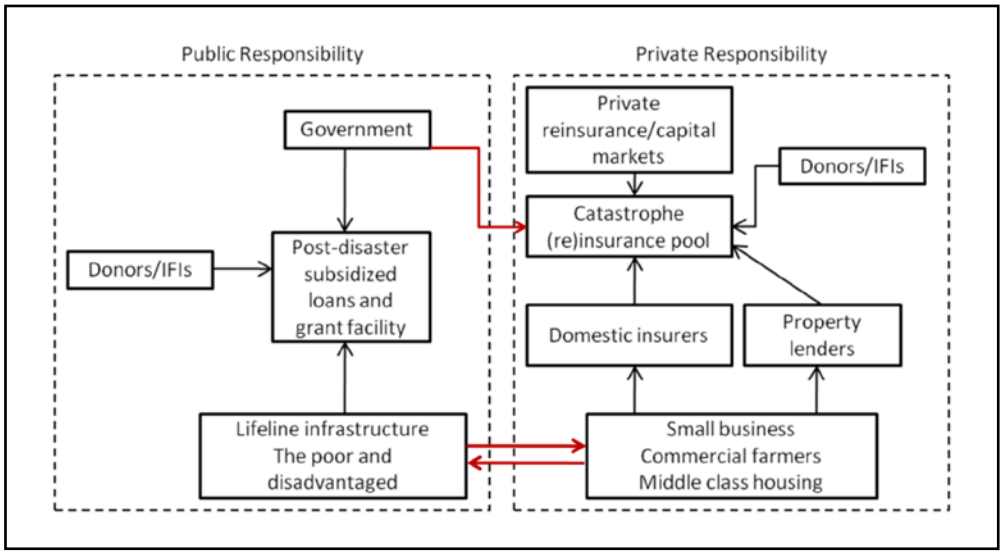


Figure 6.3: Heterogeneity of different levels of risk transfer mechanisms for natural catastrophe schemes with public intervention (Machetti, 2009)

First level of risk transfer	Systems based on direct insurance	▪ Denmark ▪ New Zealand ▪ Norway ▪ Spain ▪ Switzerland ▪ Taiwan ▪ The Caribbean (CCRIF) ▪ USA (NFIP)
	Systems based on reinsurance	▪ France ▪ Japan
	No risk transfer	▪ France ▪ Spain ▪ USA (NFIP)
Second level of risk transfer	Reinsurance or retrocession	▪ Germany ▪ Iceland ▪ Japan ▪ New Zealand ▪ Norway ▪ Switzerland
	Systems with cession to capital markets	▪ Taiwan ▪ The Caribbean (CCRIF)

The challenge of a public-private partnership is ensuring that a strategy is able to incorporate the best elements of both systems. One of the most important elements of government involvement is in the area risk reduction and implementing policy to regulate development in risky areas. This is discussed in more detail in Section 6.4.

The notion of 'Charity hazard' is discussed above and the role of governments as insurers of last resort has frequently been criticised (Gron and Sykes, 2002). However, Faure (2004) argues that from a legal perspective the role of the government as a guarantor of reinsurance is not as bad as some critiques suggest; particularly if there is still freedom for insurers to use alternatives and is not at the detriment of competition within insurance markets. He argues that a government has a role where there is a lack of development in the private market and the provision of state reinsurance may ensure that the risks from catastrophes remain insurable. Faure (2004) goes on to suggest that this situation is better than one whereby more collective solutions are implemented (i.e. compensation funds paid for by public resources) as it has the advantage of taking a premium from those at risk. This situation is particularly effective if an actuarial or risk adjusted premium is chargeable.

The majority of commentators about catastrophe recovery systems argue that although there is a place for governments in management of catastrophe risk, in general where possible the 'market' is the best option for the provision of catastrophe insurance. Government intervention (whether long term or short term) should be solely involved in facilitating market involvement in the provision of flood insurance.

6.2 The robustness and economic viability of flood recovery strategies

Section 6.1.1.4 provides specific details about the robustness of the different insurance-based approaches to flood recovery. This section will examine the overall robustness of different flood recovery strategies and examine the mechanisms which make some more economically viable that others.

The discussion above) has highlighted that there are a variety of ways in which insurance is provided for flood (and other natural perils). The different potential roles of the government and the market have been described and debated. The diversity of systems highlights a range of ways which are utilised to ensure the robustness and therefore the economic viability of a system. Different mechanisms are used to spread the risk the most common of which are bundling and via solidaristic mechanisms within a nation state. The role of bundling in risk transfer and as a solution to anti-selection is described in Section 2.2.2. There was also diversity reported in the solidaristic mechanisms discussed above; some are insurance based and involve the backing from the state (e.g. France) whilst other recovery is established via compensation funding. The differences in approach and the advantages and limitations of ex-post and ex-ante approaches in terms of robustness of the funding schemes are discussed in Section 6.1.2.

Insurance or compensation schemes whereby there is government involvement also have a mechanism for limiting losses. Often a royal degree or declaration is needed in order to invoke either compensation or insurance to be paid. This does permit a limiting of losses and exposure for the smaller events, but of course may not solve the issue of flood recovery for less damaging and potentially more frequent events and also may raises issues of equity and fair treatment between events.

All of the approaches described above aim to spread their risks as widely as possible; this might be through purchasing reinsurance or other bonds or ultimately to the State and as a result of this and other risk transfer mechanisms the schemes are financially stable as a result. Lamond and Penning-Rowsell (2011) argue that viability may be threatened where the probable maximum loss is very high relative to the potential for premium income. This may be the case in areas of very high flood risk and may potentially threaten the economic viability of the approach. Arguably this situation is similar to that described with the current system in the UK which has led to imminent changes to flood insurance provision. In New Zealand for the geotechnical perils covered this has been resolved through the first loss cover provided by the EQC. This essentially acts as a large deductible and thereby removed the first NZ$120,000 of loss from the private sector. In the new UK model this deficiency is dealt with by the pooling of resources across insurers and a formal

cross-subsidisation of premiums of the highest risk properties to ensure that premium income is high enough (and therefore ensure economic viability of the insurers) yet affordable to property owners.

An alternative scenario which may be present is when flood insurance is purchased as an endorsement to a household policy and the additional premium is such that it is not linked to the risk of the peril. Where flat-rate premiums are charged viability may be threatened if insufficient knowledge about the overall risk and exposure means that premiums are not high enough to cover losses or penetration is so low as to mean that total premium income proves inadequate.

Another strategy that a number of schemes use to manage the economic viability of the recovery approach is to provide an upper limit on the losses that are covered and/or to add a degree of co-insurance into the system. The mechanism may operate at either the policy level (such as in Austria or Turkey) or at the overall scheme level (such as The Netherlands, Belgium, Iceland). When employed at the individual level, an upper limit on indemnity means that there is a total maximum amount that a homeowner will received in recompense for their loss. For instance, in Austria there is an indemnity limit of between 25 and 50% and additionally compensation is capped at 50% of the losses sustained. If these limits are known and understood by a policyholder it may also have a positive impact on individuals taking action to reduce their losses; either through pre-event mitigation or in-event damage saving. However, in many situations policyholders are not aware of these limits unless they have been flooded in the past.

The second approach is to have a total event (or total fund) limit which applies to all of those claiming compensation or insurance. For instance, in The Netherlands there is an annual upper limit on the compensation fund of €450 million. In these situations often individual householders will only receive a percentage of their claim, often calculated as a proportion of the total amount of losses sustained within the country. This approach places an upper limit on the exposure of an insurer, the insurance system/compensation fund or the government and to a degree ensures economic viability.

These types of controls might also be extended to limit losses from repeated claims. For instance, insurance in Romania operates on an annual aggregate basis and the total value to which a property is insured is reduced by the amount of any claims paid out in any one year. Similarly, the French system increases the deductibles in areas where multiple disasters occur more than a certain number of times in the preceding five years (i.e. they are doubled if more than three declarations, tripled if more than four times and quadrupled if more than five times). This stipulation however applies to declarations within a Municipality rather than at a household policy level; although will affect all households within that affected Municipality. This again is a mechanism that can help ensure the robustness of the approach but may also encourage and incentivise risk reduction.

In general, the economic viability of insurers is unlikely to be threatened by losses owing to catastrophes as they have a range of other products on which to fall back and draw reserves. Lamond and Penning-Rowsell (2011) also argue that if there was a collapse of one insurer due to weather-related losses or other perils, usually claims are guaranteed by insolvency protection arrangements between insurers. These were enacted following the collapse of Independent in the UK in 2001 whereby claims were honoured (although sometimes only up to 90% of the value) and divided amongst the rest of the insurance industry. A similar situation occurred in New Zealand following the Canterbury earthquakes and required the government to 'bail out' the failing insurer AMI who was threatened with insolvency and had insufficient reinsurance coverage. Insurers are more likely to be troubled by a reduction in the profitability of household flood insurance and be particularly concerned where there is a high degree of anti-selection and penetration in low risk areas is minimal. This is most likely to lead to insurers beginning to refuse to cover for the highest risks (thereby reducing their exposure) or withdrawing from cover entirely as the majority of risks are considered to be too high and/or the profitability of the insurance too low.

In summary, the most robust flood recovery system is likely to be one in which regulation is not required; as the pressure of the market will mean the system should evolve if the approach is not working. Additionally, the best approach is one

which finances itself through the collection of adequate premiums and thereby where the risks are spread sufficiently so that is becomes economically viable. Finally, an ideal scheme would be one that also encourages risk mitigation thereby incentivising the uptake of measures and promotes risk sharing at the local and even individual level (GFDRR, 2011b): this is discussed further in Section 6.4.

6.3 Equity and fairness in flood recovery

A decision about the most appropriate insurance solution cannot be made solely based on arguments of robustness and economic viability. Section 4.2 introduced an assessment measure based on the concept of equity and the fairness of the approach. The degree to which a system of flood recovery is equitable or fair may vary depending upon an individual's perspective and position relative to a number of variables. Amongst many others, these might include: their individual level of flood risk, their income and consequently their ability to afford premiums, the flood experience and views about community solidarity. Local and national ideas about equity and fairness may vary according to the culture and traditions of a country. For instance, there may be countries whereby there is an expectation of government assistance to be provided, whereas in another where there is a long tradition of private insurance may mean that there is a more individualistic perspective and that all should contribute.

Each of the systems has been assessed in terms of the degree to which they are based on an individualistic perspective and insurance is provided that is priced according to the flood risk that an individual property faces or whether it is a more solidaristic approach which takes little account of individual flood risk. Overwhelmingly, the majority of international flood recovery systems adopted a more solidaristic approach: whether this is via compensation schemes (more nationalistic solidarity) or through the bundling of the flood peril with other types of insurance (insurant-solidarity). Table 6.9 maps the equity and justice implications of the different flood recovery models identified in Table 6.7.

Reviewing the schemes from Table 6.9 there are two approaches which cause most concern from a fairness perspective, where:

- Insurance is provided as optional cover within the private market and with graduated premiums and ad hoc compensation is provided by the State.
- Insurance is provided as optional composite cover from the private market and ex-ante or ex-post compensation is provided via the State.

In both of the above situations policyholders will have taken the decision to purchase insurance to provide them with a mechanism to recover from flooding and therefore will have contributed via the premiums that they paid (which in high risk areas may be considerable). However, if ad hoc compensation is provided to those who have not purchased insurance insurants will have contributed a second time via general taxation. Many international recovery systems, whereby both insurance and compensation is available, understandably prohibit those who have received an insurance pay-out for their losses also receiving compensation for the same loses. However, there may be situations (such as in Austria or Italy) where there is a limit on the compensation able to be received, therefore in these situations some of the arguments about fairness may be countered by policyholders being able to retrieve some of their losses from compensation and some of them from insurance (as long as they do not claim for the same losses twice). The numbers of people who participate in these two types of schemes is demonstrated from the examples to be relatively low; however where they do exist there may be considerable equitability issues for these people which need to be considered.

The negative impact of the presence of financial assistance via compensation on insurance penetration is discussed in Section 6.1.2. One might question why individuals would choose to purchase cover for flooding if they know that not only are they paying for their own insurance, but also will be contributing to the recovery of others. The reasons for this may be complex but may include wanting the security of knowledge that they will receive payment (as this is not always clear from compensation schemes), to provide assistance for those events not considered large or abnormal enough to trigger compensation. Additionally, policyholders may not be aware of compensation funds or not make the link between the general taxes that they pay and the financial assistance via compensation that results.

Table 6.9: The equity components of flood recovery schemes

Insurance component	Compensation	Dominant equity and fairness components
Little flood insurance available	National compensation funds	A **national-solidaristic approach** – where all citizens will contribute via taxation
Optional flood cover from the private market with graduated premiums	No compensation	An **individualistic** recovery mechanism whereby those insured directly contribute to their recovery in a price-sensitive way.
Optional flood cover from the private market with graduated premiums	Ad hoc compensation	Although some will have contributed to their own recovery – mostly a **national-solidaristic approach** – where all citizens will contribute via taxation
Optional composite insurance from the private market	No compensation	Where insurance cover is purchased – recovery is based on a **insurant-solidaristic** approach as perils are bundled together and risk is transferred across these perils
Optional composite insurance from the private market	Either ex-ante or ex-post compensation	Although some may benefit from an **insurant-solidaristic** approach; generally a **national-solidaristic** approach is dominant whereby all contribute via taxation
Compulsory inclusion of flood insurance within standard household policies[41]	No compensation	Where insurance cover is purchased – recovery is based on a **insurant-solidaristic** approach as perils are bundled together and risk is transferred across these perils – the compulsory nature of the insurance also means that the risks are likely to be transferred over a more policyholders
Compulsory inclusion of flood insurance within standard household policies	Ex-post compensation	
Pooled flood insurance operated by the market	No compensation	
Pooled insurance with a state guarantee[42]	No compensation	Generally this system follows the principles of an **insurant-solidaristic approach**; however if the state-guarantee is invoked then taxpayers will contribute in a **national-solidaristic** way
State-run and subsidised insurance	No compensation	Although an insurance system the state-run nature of the scheme and the subsidisation means that general taxpayers will contribute (therefore **national-solidaristic).** However, there may also be elements of **insurant-solidarity** and **individualism** depending on the premium mechanisms
State-run and subsidised insurance	Ad hoc compensation	

[41] The situation for New Zealand (dwellings – via the private market)
[42] The situation for New Zealand (EQC)

There are few situations which satisfy the condition of 'pure actuarial fairness' as proposed by O'Neill and O'Neill (2012). This is based on a beneficiary-pays principle and in this situation insurance costs to individuals should only directly reflect their flood risk level. In theory, it is possible for this situation to be fulfilled. For instance, in the case of the UK flood insurance system it is possible for insurers to charge an actuarially-calculated premium (the only stipulation in this case is that insurance is available); however in this situation the competitiveness of the market serves to keep the costs of premiums well below this level for the majority of policyholders.

Wider fairness issues are raised when considering insurance systems which offer cover at full actuarial rates (i.e. those in high risk areas pay the most and those in the low risk areas pay least) when considering investment in flood management measures. In many countries flood defence infrastructure is paid for (at least partly) out of national, regional or local budgets and therefore there is a wider-cross subsidy of risk reduction measures between high and low risk areas. There will be many people situated in high risk areas who have contributed via general taxation to fund defence schemes to reduce the risk (and therefore potentially the insurance premiums) of those in other high risk areas. Property-owners who live in defended areas may benefit twice from the development of flood risk management measures; firstly via a reduction in their level of risk and the probability of loss occurring and then secondly from a premium reduction if they are reclassified as being at lower risk. These arguments and others relating to the distributional consequences of flood management in the UK are discussed in more detail in Penning-Rowsell and Pardoe (2012a; 2012b).

6.3.1 Other dimensions of equity

There are other notions of equity and fairness that need to be considered and have emerged during the comparison. The first is equality between events and whether all victims of flooding are treated equally. This is a central tenet of the French recovery system whereby the equality of treatment of victims was considered to be one of the key aspects when designing the State-backed insurance system. However, this equality of treatment is undermined in this case by the lack of a clear list or description of those perils which are included which creates a lack of transparency and security amongst policyholders.

This situation is replicated in those countries which offer compensation on an ad hoc basis. As described above in Section 6.1.2 this may lead to flood victims being treated differently, with some receiving compensation and others suffering similar losses not receiving any financial assistance. Faure (2004) argues that there may be a political component to the provision of compensation with particularly generous terms being provided following the 2002 Elbe-flooding which may not necessarily be provided for other events in the future. There also appears to be an inequity in treatment between those who are affected by flood events or a smaller scale to those on a larger scale. Typically, for compensation to be granted from some of the schemes an event needs to be declared as a disaster or of 'abnormal intensity' (in the case of the French system) and therefore often will only therefore include events which cover a large area or encompass high damages. Even if more localised or minor flood events affect households in a similar way (in terms of depth, velocity, duration or household damage sustained) they may not be compensated due to the nature of the total event experienced. The Spanish example is identified as being one in which provides an added element of equity in this regard. The events which are covered and therefore finances received are legally defined and are based mainly on the frequency or the intensity of the peril; rather than the size of any losses (CCS, 2008). This means that even if only one household is affected by flooding (of the magnitude or frequency as legally defined) then they will be entitled to claim irrespective of the extent of the flooding and any losses suffered by other households.

From this specific perspective, on the whole insurance might be considered to be a fairer approach than compensation. Insurance systems which offer coverage which is insensitive to the risk may have inequality between risk areas in terms of the cost of the premiums (i.e. those at high risk will be paying the same or similar as those at low risk) however at the time of a claim policyholders are generally treated equally and at least they have the security in the knowledge that they will be covered. Additionally, when a composite insurance policy is offered policyholders at high flood risk may have a lower risk of sustaining damage from other perils and therefore

the equity in the premiums paid may be spread over a number of perils.

6.3.2 Addressing the needs of low income households

Another aspect to consider in assessing equity and fairness approaches in the provision of flood recovery is the degree to which those on lower incomes are assisted following flooding. In this regard, generally compensation mechanisms fair well as they often will provide assistance to all of those impacted (within the specified or declared geographical and time limitations of an event). Where compensation is not offered to all those affected, commonly the lower income households are targeted for financial assistance. This is true of a number of the international recovery schemes reviewed here; including Germany which offers compensation with an element of means testing and Mexico whereby recovery funding and compensation is targeted towards lower income housing.

In addition, there are insurance approaches which have some elements of assistance for those who may struggle to afford insurance. For instance, in the Romanian system it is reported that the government assist by directly insuring those who receive welfare payments, rather than expecting them to be able to afford cover via the private insurers. The proposed UK pooled insurance system also introduces a formal cross-subsidy for the flood element of the insurance and places a premium cap intending to subsidise the high risk properties. The premium cap proposed by the scheme however varies for different sized properties (based on a property-level band of taxation) and is acting as a proxy to ability to pay. No premium cap and therefore subsidy is offered to the largest properties. However, despite the cross-subsidy there are likely to be many low income households who will still be unable to afford insurance and therefore the movement towards a more risk-sensitive approach will make the system even more unjust. Additionally, in situations whereby all are contributing to flood risk insurance and there is a cross-subsidy in place to support high-risk households there will inevitably be some low income households (who are at low or negligible flood risk) subsidising those with higher incomes; creating a potentially unjust situation.

In situations where flood insurance premiums are priced at a flat-rate as an add-on to existing policies; those whereby it is calculated as a percentage of the base policy or as a percentage of the insured value (such as New Zealand (EQCover) are considered to be fairer than just applying a single fixed amount. This is because the former two conditions takes account of the value insured and thereby those who will claim less (because they have less to lose) will pay less in proportion towards premiums. Where a single fixed amount is charged, although it might be considered to be more equitable to charge all policyholders the same, in actual fact there may be large differences in the amounts being insured and the demands that policyholders may make if insurance is being paid out.

From an equity perspective one might consider the fairest approach to be a system whereby the costs to individuals should only reflect those risks that result from each individual's choices. This choice-sensitive perspective on fairness is reflected in a number of the recovery systems which have stipulations about not providing cover for newly constructed property in known risk zones and in others those in the highest risk zones (e.g. Germany) are considered uninsurable. On the face of it, this might seem to be a just and fair approach to the pricing of insurance, that if a householder chooses to live in a risk area then they should pay more towards the insurance to gain cover and this is a choice that they make. However, O'Neill and O'Neill (2012; 11) argue that "A choice is voluntary only if it can be reasonably foreseen and the agents have real and acceptably alternatives to it (and neither) condition is present for many victims of flooding". Therefore the extent to which many people will make choices, or informed choices, about their flood risk is questionable.

Flood risks are dynamic and increased knowledge about risk and the inclusion of other types of flood risk (such as surface water or groundwater) may lead to changes in the assessment or designation of flood risk areas. This may occur after a decision to move to an area has been made. Even those who purchase new properties in flood risk areas may not reasonably expect to know all of the flood risks where the planning system may not have made explicit all of the facts. Choices for those who are in the rental sector and in particular those who are on low incomes may be even more limited.

O'Neill and O'Neill (2012) argue that the most socially just insurance system is one in which solidarity plays a key part and that insurance should be provided independently of the risks and choices of individuals. The mechanism of the solidarity component of the insurance system is considered to be the most important in encouraging fairness and equity in flood recovery approaches.

6.4 The efficiency of flood insurance and compensation schemes: Implications for promoting mitigation, adaptation and community resilience?

The third assessment criteria introduced in Section 4.1 is the efficiency of the recovery scheme in promoting risk reduction, adaptation and community resilience. There is a high potential for insurance cover to be used to incentivise the uptake of flood mitigation and loss reduction measures, undertake adaptation and promote community resilience. As Kunreuther (1996; 180) argues that "In theory, insurance is one of the most effective policy tools for achieving both objectives, because it rewards investments in cost-effective mitigation with lower premiums and provides indemnification should a disaster occur."However, the degree to which it is desirable for insurers to promote resilience and risk reduction depends upon how the cover is organised and the premiums which are charged. Theoretically, if individual insurers have a good understanding of flood risk, are able to assess the risk well enough to effectively price that risk and achieve actuarially-price premiums from customers then there insurers would have little interest or need to be concerned about the degree of risk nor the need to incentivise resilience behaviour. However, from the international examples, insurance systems which satisfy these conditions are limited.

There is a wide range of ways in which flood mitigation and risk reduction activities may be introduced and a variety of scales; from individual household level measures, to community resilience schemes, up to regional or national strategies. Insurers and insurance schemes may impact upon all of these levels although the mechanism that they achieve this (e.g. lobbying government, placing restrictions on coverage, offering a reduction in premium) and incentivise mitigation can vary considerably. The following sections discuss those measures which were identified in the comparative review along with international examples of where they were present.

6.4.1 High or actuarially-priced premiums

The presence of actuarially-priced premiums which in high flood risk areas may be substantial may be sufficient to incentivise risk reduction measures in return for a reduction in those premiums. This may only be the case in situations where insurance is compulsory or at least compulsory with a mortgage. There are few international examples of this seen in the comparative review. Where actuarially-priced premiums are charged the insurance penetration is so low that it will not have a major impact on flood risk reduction. In other situations, such as the UK, where risk-reflective premiums could be charged the competitiveness of the market is such that this keeps premium levels low and reduces incentives for individual risk reduction activity.

In Turkey, the insurance offered as part of the TCIP has some premium variation based on the risk, the size of the property and the type of construction; ranging from 0.44 per thousand for well-constructed properties in low risk zones to 5.5 per thousand for poor construction in high risk zone (CCS, 2008). Although this relates to the risk from earthquakes, premium differentiation of this nature could be adopted by other recovery systems for flooding and could incentivise better construction in areas of risk.

6.4.2 Exclusions of properties from insurance coverage

Excluding properties from cover is a common mechanism which is used to try to reduce both the exposure of insurance companies or compensation funds. Exclusions primarily relate to newly built properties in areas known to be at flood risk and aims to improve **spatial planning**. This condition forms a part of a number of international examples reviewed in this study; e.g. Belgium, Norway, Denmark, United Kingdom and France. The exclusion acts to try to prevent increasing the number of properties in flood risk areas. However, the degree to which an exclusion of insurance coverage acts as a deterrent for development in areas of flood risk is debatable. It may have some impact in those countries whereby flood insurance is compulsory (or whereby household insurance is required to secure a mortgage) however in situations whereby insurance is optional it may have little effect. In order to be more effective

insurance coverage needs to be widespread in order to have a significant impact. Lamond and Penning-Rowsell (2011) argue that there is little demonstrable evidence that restrictions of insurance cover have had a verifiable impact on the reduction of development in the floodplain.

In addition to the exclusion of insurance for new development in flood risk areas, there may also be an exclusion of all properties in the **highest risk zones**. This is the situation in Germany where areas have been categorised by flood risk (ZÜRS) of which the highest (probability of flooding is greater than 1 in 10 years) is considered to be uninsurable. This of course may in theory dis-incentivise the construction of new properties in these areas and incentivise other risk reduction activities for existing properties. However, the non-compulsory nature of flood insurance in Germany means that this impact will be significantly muted.

As well as entire properties being excluded there was also a situation in Italy where certain contents was excluded from coverage. Fiselier and Oosterberg (2004) reported that there are often exclusions place upon contents located on the ground floor up to a certain height (e.g. 20 or 30cm). Insurance penetration in Italy is low and therefore the potential impact of this exclusion will be extremely limited, however for those who have purchased insurance it may serve to encourage resistance activities and especially for people to evacuate or raise properties before or during a flood event.

6.4.3 The level of indemnification or percentage of loss compensated

The level of indemnification present for any insurance system or the percentage of loss compensated by any fund, may also impact upon risk reduction activities undertaken at the household level. This may be through the adoption of pre-flood household level mitigation or damage-saving action during a flood event. As briefly discussed in Section 6.2 when examining ways in which schemes limit their losses, a number of approaches cap the losses that can be claimed or limit the total liability of the scheme. The system in Austria is a good example of where this is the case whereby insurance is provided with a limit on indemnification of 25 to 50% of the property value. Italy also caps the level of the sum insured; in this case to 50% of that insured for fire. A number of schemes also have total event loss limits or fund limits in any one year (Belgium, Iceland, The Netherlands). Both of these limits will serve to increase the level of burden on the individual householder who may want or need to reduce their risk in order to reduce their losses following a flood. Arguably the former situation whereby the limit is applied at a household level and therefore may also be known in advance of an event, will be more likely that that applied at the scheme level. However, in order to be effective to incentivise action (i.e. prior to being flooded) the policyholder needs to be aware of these limits and often commit to spending money to increase the resilience and resistance of their properties.

The more common and traditional way of introducing a level of co-insurance into an insurance scheme is through the application of **deductibles**. As discussed previously, this is the amount that the insurant is required to pay following a claim and may be described either by a set value or as a percentage of the loss. Most of the international examples of flood insurance schemes compared in this study employed deductibles; although the value of these varied quite considerably. Deductibles have long been used as instruments to control moral hazard the rational being that if policyholders have to contribute a percentage of the loss before they are fully-indemnified then they will make efforts to reduce the overall total loss. Indeed, Wang et al. (2008) argue than empirical findings strongly supported the notion that increasing deductibles did help to control moral hazard. High deductibles may create a larger incentive for property-owners to consider adopting mitigation measures as they will increase the amount of the total loss that they would have to bear and absorb following a flood event. Increasing deductibles, particularly in high risk areas, might be one way in which the cost-effectiveness of mitigation measures can be increased as this potential extra cost to the policyholder should be off-set against the cost of implementing mitigation. However, the extent to which policyholders will take notice of high deductibles in advance of flooding is debatable. The cost to them lies in the future and is one that may never even occur. Therefore, an increased premium (which to policyholders is a tangible cost) may be more likely to impact upon mitigation behaviour. Despite this, there is the potential to also introduce graduated deductibles as Thieken et al. (2006; 385) suggest that “Ideally, the deductible should be linked to the risk of the insured object so

that particularly high-risk households have the strongest incentive to undertake mitigation measures".

6.4.4 Conditions in order to participate within an insurance system

A further incentive for mitigation is through the placement of special conditions on policyholders if they wish to purchase insurance. The first area relates to complying with **special building regulations**. Insurers seemed to be particularly interested in the structural integrity of dwellings; however less interested perhaps in other aspects of resilient design. There were many instances within the international examples which required policyholders to adhere to **building codes** or comply with particular construction standards in order to be able to secure insurance. Insurance could be removed or properties excluded if they were poorly constructed or maintained. International examples of this nature include Spain, Turkey, Iceland, Norway and Romania. However, often these construction standards related primarily to making a property more resilient to earthquakes and therefore may not impact upon their resilience to flooding. There is no reason however, why this type of approach might not be extended to other schemes in particular in high flood risk areas to encourage flood resilience and resistance.

The most comprehensive approach which is trying to encourage mitigation, often through the raising of properties, is the NFIP in the United States. This insurance scheme has many conditions relating to risk reduction and communities are only permitted to enter the insurance scheme if they participate fully in complying with the requirement to undertake risk assessment and then further mitigation activities. Despite the good intentions however, due to a lack of enforcement and the often disputed risk assessment process, it is unclear the extent to which the NFIP has impacted positively on risk reduction. This is one of the aspects that is hoped will be improved upon under the new reformed program. Building codes have often been considered to be fundamental to insurers reducing their risk from future losses (Kunreuther, 1996; Kleindorfer and Kunreuther, 1999). However, in order to be effective for flooding this would need to be water-damage specific and go beyond many of the measures currently implemented. Additionally, the issue of enforcement would also need to be addressed with some relatively easy and cost-effective ways of checking whether properties have met (or even exceeded) the required building standards. Any change of this level is likely to need government involvement and even regulation.

Introducing **individual property-level mitigation measures** is another aspect of risk reduction that might be incentivised by insurance or other recovery schemes through the placing of special conditions on insurance coverage. In Belgium (Appendix A1.3) an insurer can stipulate that a property-owner is required to prove that they have taken a series of important preventative measures in order to limit risks of flooding. However, this option is not anchored into the legal framework and it is unlikely that it is often invoked. Both Denmark and Iceland have inclusions within their policies that if properties have been flooded in the past then there is the need to adopt preventative measures and that insurance can be reduced or refused as a result. Again it is unclear how often these clauses are invoked and cover is actually refused. In the Romanian system a limit on the amount claimed is placed on an annual aggregate basis (Appendix A1.13). Although this may only be applicable to the very highest risk properties this may encourage them to adopt risk reduction measures. These high-risk scenarios are also the instances where individual risk reduction measures will be most cost-effective.

Evidence from existing insurance systems have highlighted that there are actually few instances where individual mitigation measures are effectively incentivised. There may be a number of reasons for this failing, including:

- Policyholders lack awareness of the fact that their insurance policy does not fully cover them from loss and therefore they are not aware that they might need to reduce their risk
- A lack of awareness and/or understanding of their flood risk and the scale of any potential impacts
- An inability to understand the trade-off in terms of availability/affordability of insurance and the cost of the mitigation measures.
- A lack of awareness of the potential options to reduce risk
- Incentives for implementing individual scale measures remains insufficient

There is often a lack of evidence about the effectiveness of incentivising mitigation (and in particular household scale mitigation) through insurance products (Kunreuther et al., 2013). Although there is evidence there can be significant financial benefits of the adoption of adaptation measures, the numbers of property-owners voluntarily investing in measures is limited (Kunreuther et al., 2013). This seems to be for two reasons. First, the incentive needs to be worthwhile and cost-effective. For instance, in a private market-based insurance system where prices are highly competitive the financial effectiveness of implementing mitigation may be marginal and this may act as a disincentive to uptake. Second, the assessment of the cost-effectiveness of the measures is often itself complex. In bundled policies, even when there is a risk-reflective element to the premiums, a policyholder may not appreciate the true cost of the flood component of their insurance. Assessing the true value of the adoption of mitigation on insurance premium is also difficult within a single-year policy. Kunreuther (1996) suggests that insurers believed that there would not be significant demand in voluntarily adopting measures for a small annual premium reduction which would look trivial in relation to the outlay on risk reduction. Thirdly, a limited uptake of mitigation may be partly due to the insurance industry or governments failing to ensure that the rewards for action are either inadequate or insufficiently promoted. Finally, another barrier is considered to be the short-term nature of insurance provision and a lack of certainty that any investment will continue to be financially rewarded when insurance premiums are set. Michel-Kerjan and Kunreuther (2011) and Kleindorfer et al. (2012) have both proposed adopting the use of multi-year insurance contracts for natural hazards which will better enable mitigation to be encouraged.

All of these are barriers to the uptake of mitigation measures and each will need different strategies to tackle them. However, if the level or type of incentive is appropriate and sufficient then it is more likely that there will be motivation for any other barriers also to be overcome. From an insurance perspective the more effective mechanisms as part of the private market relate to availability and affordability of cover.

The inability of some people to obtain insurance may have the power to motivate them to reduce their flood risk in order to try to obtain insurance. This is likely to be most powerful where there is some compulsion to purchase insurance including when there is the need to have insurance to secure a mortgage. Not being able to secure insurance on a house may have severe implications from defaulting on the terms and conditions on a home loan and will also limit potential opportunities for selling the property and its resale value if potential buyers are unable to secure a mortgage.

From an affordability perspective a reduction in premiums may be a sufficient incentive to adopt mitigation measures. However, from the international examples investigated in this study it is clear that premium reductions are not currently being effectively used to promote risk reduction; although research in this area is limited. Thieken et al. (2006) were able to provide some information from a survey in Germany which highlighted that only 14% of insurers that were surveyed suggested that they rewarded voluntary private mitigation. There is much more scope for individual mitigation measures in the case of price-reflective premiums and a lack of uptake is partly due to the fact that there are very few situations where sufficiently high premiums are charged and flood insurance is a compulsory peril. Therefore, those who are unable to afford insurance are just not buying it, rather than reducing their risk or by making their properties more resilient to flooding. There are also a very large number of insurance schemes whereby premiums are offered at a flat-rate and therefore the scope in which to incentivise mitigation in this way, by reducing premiums, is limited. Hunter (1994) suggests that insurers have been slow to encourage the uptake of resilience and mitigation measures as in the past they did not see their role as a promoter of safety and equally they were concerned about a potential negative financial impact on their profits.

Insurance systems where there is more government involvement may have more opportunities to add special conditions on the insurance in order to compel policyholders to take measures. However, similar to the private market where insurance is not compulsory and/or widespread it will be difficult to influence resilience to flooding on a large scale.

6.4.5 Retrofitting insurance following flood events

Another area to explore increasing resilience of properties in flood risk areas is through retrofitting

that resilience or resistance into properties following flood events. There is the real potential for this to impact upon the risk of properties and any subsequent future damages. However, there was little mention of this within the international examples investigated in this study. It may be most easy to initiate this whereby there is government intervention and it is made a requirement when insurance is paid out or compensation to try to restore the property more resiliently. However, this is often considered to be more expensive than restoring it to how it was prior to flooding and therefore in the short-term may cost more. In situations where the amount of recompense gained is not equal in value to the damages sustained, victims may not be able to afford to reduce their risk as their properties are restored.

Where insurance is provided via a private market there is often also other barriers to retrofitting resilience following flooding. Insurers often express a similar argument to the above that restoring a property in a more resilient or flood resistance state is more expensive for them. Although it would be possible for them to invest more money and reduce the risk in these properties, thereby also reducing their exposure, since the majority of insurance policies are renewed annually they are only guaranteed this business for a maximum of a year in the future and therefore it is not cost-effective for them to make these investments.

Insurers in the UK have also reported in the past other barriers to them working together to try to instigate more flood resilient or resistant repair following flood claims. They argue that it may be possible for them to come to some agreement whereby they would be prepared to try to repair resiliently as a standard; even though it would be more costly to do so. However, they are concerned that working together in this way would be considered to be in contradiction to anti-competition legislation.

Insurers would also need to gain the agreement of the homeowner with regards to the measures that were implemented and in the past some insurers in the UK have discussed that they have found some reluctance from property-owners as they did not like how the more resilient properties looked (ABI, pers. comm.). This hesitancy might of course be offset in the future if property-owners knew that they could drastically reduce their future premiums or were aware that they would only be able to obtain insurance in the future if they undertook these actions.

6.4.6 Insurer bias towards government-led risk reduction and mitigation

Amongst private insurers there appears to be a preference for government-led or community scale risk reduction measures or the use of development control, above the adoption of individual mitigation measures or resilience. There is often the perception amongst insurers that these measures are much more effective than household-scale resilience and that as they will be installed and maintained by authorities they are therefore more likely to reduce risk than other measures. There may also be a transaction cost and risk assessment argument for preferring large-scale flood management measures over household flood resilience. Mitigation on the household-scale will not be represented in flood risk mapping and therefore in order to price the risk for those properties risks will need to be assessed on a house-by-house basis; thereby increasing the cost of writing the business. They may be more likely to offer a reduction in premium when the risk reduction action is something permanent (e.g. raising the floor level) whereby any reduction in the risk will continue to be effective over the long term. Achieving an appropriate balance between governments' providing risk management, yet also allowing the insurance market to work effectively in incentivising risk-reduction behaviour is difficult and complex; not least since ultimately insurers would prefer governments to invest public monies in risk reduction. Hung (2009) argues that in many situations government's flood prevention construction is considered a normal substitute for, rather than a complement to, flood insurance. In many countries insurers can be quite powerful in lobbying for increased public spending on flood risk management and White (2011) argues that establishing strong private-public partnerships (between insurers and governments) can both guide and have a positive influence on public spending on risk mitigation and prevention.

Insurers may also be apprehensive about offering premium reductions for certain types of mitigation measures (e.g. flood gates, flood boards, flood skirts etc.) when there is little long-term evidence about their effectiveness. Similarly, to be effective in reducing the risk some of these measures require the receipt of a flood warning and the

measure to be installed in good time and effectively prior to the onset of flooding. Therefore, insurers are reliant not on the authorities, to install these measures at time of flood, but on the policyholder. Although there is clearly the incentive for the policyholder to do their best to prevent the ingress of water (not least to prevent a huge increase in premiums at policy renewal) there may be occasions whereby a homeowner is not at home or not able to get home quickly enough in order to implement measures.

This whole argument raises the issue about whether resilience and risk reduction is the responsibility of the State or the individual property owner. Ideally one might argue that there would be elements of both. There are many arguments towards the viewpoint that a scheme with actuarially-based premiums is best. Botzen and van den Bergh (2008) identify the key advantages of private insurance arrangements. They argue that their ability to limit total economic losses when they effectively incentivise loss-reducing measures and additionally premium differentiation (with high premiums in high risk areas) can be an aid to spatial planning and decrease the desirability to settle in risk-prone areas. Whereas, Faure (2004; 21) presents the complementary argument that compensation is inhibiting the effect of risk-based pricing "If the state simply provides full compensation ex post this will dilute any ex ante preventive effect that one would normally expect with differentiated insurance premiums". However, currently there are few insurance systems which rely upon risk-based pricing and clear examples of where mitigation and resilience has been enhanced through insurance involvement (other than via lobbying the national government) are limited.

Despite the opportunities and the high potential for insurance to impact on mitigation, to date the outcomes appear disappointing. Thieken et al. (2006) argue that insurers could be doing more to encourage the uptake of measures through clear premium or deductible incentives. However, they are also well placed to offer information about those measures that might be taken to increase the resilience of a dwelling as they will have contact with insurants at least on a yearly basis.

7 Implications for the resilience of older people

This section discusses potential implications for New Zealand in relation to the use of insurance as a mechanism for recovery from flooding and associated hazards. Although the discussion will focus primarily on the issues of the resilience of older people to flooding many of implications are more general and will include implications for the rest of the population and questions of maintaining insurance cover for other natural perils.

7.1 Functioning of the New Zealand system and potential implications from international examples of flood insurance

In comparison to a number of other situations a system has emerged in New Zealand, which has permitted insurance coverage for a range of natural hazards. In particular, the provisions of earthquake cover on a compulsory (i.e. if you have household insurance you are not able to opt out) and relatively universal basis (i.e. all risks are permitted into the pool) is quite an unusual feature of natural hazard recovery schemes. Although the previous section (and Section 5) often examines the role of both the EQCover and the private insurance cover separately, in reality they both combine and work together to deliver financial resilience and recovery and therefore this section will consider them as such.

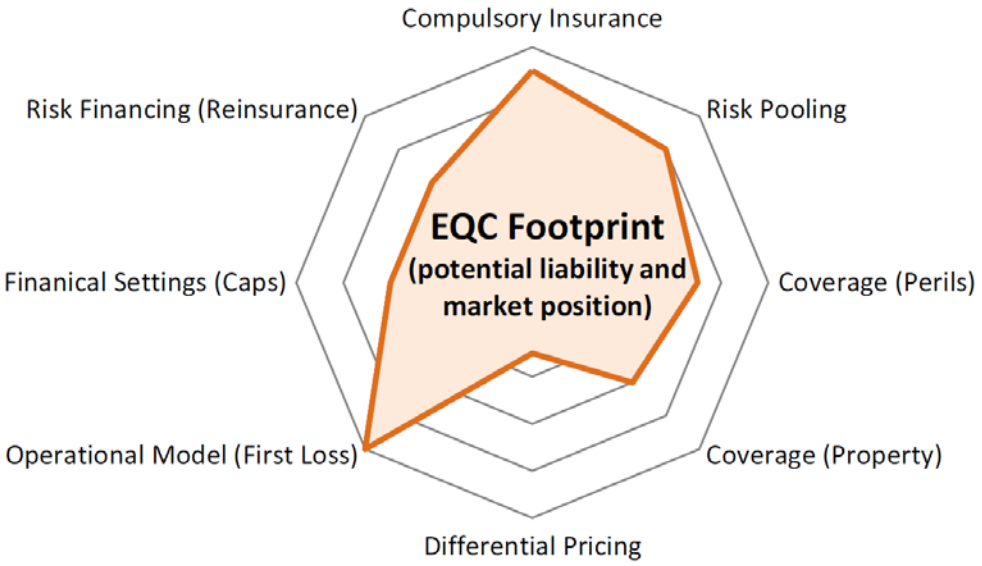
The intervention of the state, the creation of the Earthquake Commission and the State guarantee that they provide for these potentially high losses is described by the EQC (2011) as a 'market-enhancing intervention' as it is believed that the private market on its own would not be able to cover such high losses. Importantly, New Zealand does not have a compensation scheme for natural hazards and therefore citizens are not discouraged from taking out insurance cover as they are in other countries (i.e. Italy, Austria). A key characteristic of the New Zealand system is the pooling of the catastrophic risks. Section 6 highlights a number of different types of pooled-system but the value of the one in New Zealand is the high degree of solidarity that it affords. In contrast to many approaches, participation in the scheme is compulsory and insurance penetration in New Zealand is very high which means that the risks can be spread widely across the majority of homeowners. This is particularly important in a country with a low population. Indeed, the UK Government are trying to adopt a similar model for flood insurance (see Appendix 1.18). The difference being that only claims for high risk flooding are ceded into the pool; lower risks will still continue to be funded on a private market basis. One key difference is how individuals are treated. Under the New Zealand EQC approach all pay into the pool and when they suffer an event all are able to receive out of it. Under Flood-RE all policyholders pay in, but essentially only the higher risks are directly benefitting from the funding.

Another unique element of the New Zealand approach is the inclusion of losses to land. Many insurance or compensation schemes internationally restrict recovery payments to property. It is not entirely clear why the damages to land remain in the scheme although it is likely to relate to the highly vulnerable nature of land to earth movements in New Zealand. Losses to land are restricted to areas associated with buildings and aims to ensure that properties remain inhabitable. However, it has been suggested that this is one element of the scheme which may be under review in the future.

One of the key challenges of the approach is the balance and interface between the EQC and the private insurers and also between private insurers. A high level of coordination is needed between the EQC and insurers to ensure that a claims process runs smoothly. One issue concerns communication and relates to the difference in the approach to insurance adopted by different insurers. Each private insurer is permitted to set different entitlements as there is no standardised policy in New Zealand. This means different policyholders may have varying terms and conditions which create tensions when claims involve both private companies and the EQC. There is much room for improvement related to this interaction. This problem is exacerbated when claims are handled for multi-units as within the one structure it is possible for units to have coverage with multiple insurers and/or for some units not to be insured at all. This can create a multitude of problems following the impacts of adverse natural events.

Only by considering how the different elements combine together and function and considering the scheme holistically can the true effectiveness and robustness of the approach be considered.

Figure 7.1: EQC insurance footprint (potential liability and interaction with private insurers)



EQC (2011; 26).

The EQC (2011) have diagrammatised what they have termed the 'EQC footprint,' (Figure 7.1) which presents an (unscientific) rating of the different components of the scheme and how they relate to different components of the private market). This highlights that potentially more of the risk could be moved to the reinsurance market, although there are associated costs. All of these parameters and the balance between them (and thereby the balance between the responsibilities and exposure of both the EQC and the private insurance industry) will need to be considered when potentially making any changes to the system. Both schemes are sufficiently flexible to be able to raise additional funding (through increased premium surcharges and household premiums) in order to compensate for any changes made (EQC, 2011): however there is a delicate balance to be drawn between charging more to increase the sustainability of both the private market and the EQC and retaining affordability. High penetration is one of the key characteristics of the insurance systems in New Zealand as described above and this has a positive impact upon the spreading of the risks (and thereby the viability of insurance products) and the resilience of all citizens.

Although there are some elements of mitigation tied to the current system, it is difficult to really see what impact this is having on risk reduction. Strict building codes are the main mechanism being used to modify behaviour in an attempt to make properties less susceptible to hazards, but these mitigation efforts are dominated by earthquakes. Indeed, it has been argued that on an individual basis the EQC can lack visibility of individual customers. This raises compliance issues and in particular with land settlements and any reduction of future risk. Therefore, it is difficult to see whether the pay-outs have had any positive impact upon preventing future claims. Receiving multiple claims for the same properties or land is one of the key threats to the robustness of the scheme and there needs to be an increasing focus on ensuring that, where possible, action is taken to reduce future risks. Furthermore, perhaps the EQC could learn from other systems such as that in Belgium whereby claims are paid in two instalments: 60% is granted immediately with the remaining 40% only being received once the claimant proves that the money had been spent on recovery. Additionally, there is much that New Zealand insurers and risk managers might learn from other countries in terms of the promotion and adoption of flood risk mitigation.

From a negative perspective, the lack of any risk-based pricing raises questions about the fairness of the approach. Although the scheme may be positively viewed from an equity standpoint that all risks are able to be covered, undoubtedly this means that some residents at low risk will be overpaying for their cover and some at high risk underpaying. Across a number of perils this cross-subsidisation element of the risk may balance itself out; with some residents being at higher risk of

some perils and not others. However, when we consider the move to introduced risk-reflective premiums for other risks not included within the EQCover other fairness issues emerge and questions are raised. Why are the risks from some natural perils effectively 'nationalised' and subsidised across all citizens[43] and others not. Additionally, the lack of a pricing difference means that many lack the incentive to take action and thereby the positive impact on behaviour may be limited. Similarly, the low deductibles associated with the scheme may be contributing in some instances to moral hazard.

The importance and benefit of the central role of government within such a scheme is highlighted when one considers the situation in other countries with regard to the provision of natural hazard insurance by solely the private market. In many instances (such as the United Kingdom, Norway, Sweden), private insurers are removed from the management of those risks and as such decisions are being taken by government agencies (about such aspects as mitigation investment decisions and the prevention of new risks through spatial planning) which directly impact upon the exposure of insurers. To some extent this is still the case in New Zealand in relation to flood insurance cover for dwellings and insurers are generally concerned about issues such as managing increasing risks and the failure to prevent new development in flood prone areas. However, for those perils covered by the EQC those insuring the risk (i.e. the government-backed Earthquake Commission) are also directly involved in managing and mitigating it. For instance, the EQC has a programme of education and capacity building amongst communities and tries to promote proactive action as well as offering reactive recovery.

7.2 The insurance situation post-Canterbury earthquakes

There are of course many individual stories of frustration in particular about the lengthy time it has for recovery to occur and the levels of pay-outs received following the Canterbury earthquakes and for those families it must seem like the insurance system is not working. Additionally, many of those who were affected by the earthquakes have also subsequent experienced frequent flooding. Despite these issues, at a national level, the current insurance system in New Zealand has worked relatively well considering the stresses that it has been under since the Canterbury earthquakes and has proved to be robust. The system has managed to handle an unprecedented number of claims: with approximately 100,000 properties damaged and 10,000 properties requiring demolition.

Furthermore, the insurance industry as a whole has managed to recover and the vast majority of insurance companies have been able to effectively manage their risk and although there were a number of difficult years the industry has managed to evolve and through the use of market tools (such as higher premiums) the situation is now more stable and the whole household insurance market is more sustainable and profitable as a result. Indeed, moving forward the market remains competitive and although some insurers withdrew from offering commercial insurance, only one insurer with a relatively minor market share stopped offering residential household insurance. The exception to this situation is AMI and the necessity of the government to provide financial assistance. It is hoped that the additional regulation and in particular the increased reinsurance requirements will limit the chances of this being necessary in the future. Despite the recovery of the private insurance market and the continued functioning of the Earthquake Commission, there are a number of emerging challenges (e.g. the NZ Treasury review of the EQC, a recognition that the EQC caps may be too low, greater knowledge about flood risk, changing rates of home ownership) which may also have implications to a higher or lesser degree on the effectiveness of insurance as a mechanism for improving the resilience of older people.

7.3 Future resilience of older people in New Zealand through insurance mechanisms

The international review and the assessment of the current situation in New Zealand have highlighted the strengths and weaknesses of the approach. There have already been changes to both the EQCover and private market insurance and with the NZ Treasury review and further developments in the market mean that there may be changes in the near future. This section discusses the outcomes of these changes and

[43] It is recognised that in most cases this will not include all citizens, but only those with household insurance. However, if the government is required to inject funds as they have following the Canterbury earthquakes then some of the losses are thereby spread over all of society.

potential future developments and their implications for consumers. Although many of the outcomes are relevant to all householders, this section will emphasise the situation for older New Zealand residents and highlight the barriers to, and opportunities for, promoting the resilience of older people to flood events.

7.3.1 Maintaining affordability of flood insurance cover for older people

Over the past few years there has been a considerable rise in insurance premiums with some homeowners seeing their premiums double, but most observing an increase of a third. There are multiple reasons for these increases (see also Section 5.3.1.1) and a range of issues which may lead to further premiums increases in the future. These reasons include:

- The Canterbury earthquakes and the losses that insurers have sustained.
- Threefold increase in the premium surcharge of the EQCover
- Goods and Service Tax (GST) increases
- Requirements for insurers to significantly increase their reinsurance coverage due to new government regulations
- Greater use of geotechnical maps to identify areas at high hazard risk and a move towards risk-reflective pricing.

Premiums have begun to increase and although it is difficult to predict precisely how the market will react to issues such as flood risk-based pricing it is likely that premiums will rise for some homeowners particularly in the high risk areas. Although this may be considered to be a negative development for individual property owners, premium increases may be essential for the resilience of the insurance industry in the future and for the viability of insurance coverage for all householders.

In some regards, a private market should move to regulate prices as there is a delicate balance to be struck between increasing premiums, so that a company obtains enough income for cover to be viable (and profitable) but also ensuring they are not too high to prevent widespread take up of insurance. If the principles of insurance are considered, as soon as prices rise too much, then the whole premium structure falls away and the viability of the whole system of coverage will collapse as insurers will not have a sufficient spread of different types of risks and sufficient premium income.

However, despite this there is still likely to be affordability issues for many residents: this will be particularly pronounced for those on lower incomes and for older people who are more likely to be on fixed incomes[44]. People choosing not to purchase insurance coverage is likely to be more marked for contents insurance which lacks any compulsory element and so this is likely to be the first type of coverage that gets dropped. The impacts may also be more evident for older residents residing in their own homes who may have paid off their mortgage and thereby also do not have the compulsory requirement to purchase buildings insurance.

Indeed, with the move to the sum insured system this may permit those who are having affordability issues to purchase lower levels of insurance cover than the actual value of their assets which would mean a lower premium cost. Due to the prohibition of the 'condition of average[45]' this may still allow these homeowners to have some degree of financial recovery in the event of a loss although of course this may be insufficient to cover all of their losses depending on the degree of underinsurance. It is also a practice that should not be widely promoted due to uncertainties and the negative impact that it may have on the private insurance market and conversely may also lead to rising premiums for all. However, in reality this practice may become more widespread.

Affordability of insurance may prove to be a major threat to older people on fixed incomes and thereby in order to maintain their financial resilience to floods (and other perils) in the future there may be the need to examine creative methods to assist them in paying for insurance products (such as paying proportional elements).

In particular, the greatest threat is arguably to older people living in high flood risk areas, if insurers do decide to introduce more risk reflective premiums. Thereby, measures may need to specifically target these groups of residents in order to maintain affordability. This may be

[44] The majority of older people in New Zealand are primarily reliant on National Superannuation for their income

[45] See Section 5.3.1.2.

through looking to individual property or community based measures to mitigate the flood risk in these locations. Where retirement villages are located in areas of flood risk (in particular where a unit title model is adopted) operators should be encouraged to take mitigation action as of course it is also in their interests to protect their assets from flood risk and also to reduce their insurance premium costs.

7.3.2 Maintaining the availability of flood insurance for high risk properties

There is the potential danger with a move towards risk-based pricing that some properties may become excluded from cover altogether. Nothing has really changed yet and the majority of properties are still able to secure household cover for flooding, however with a greater awareness of flood risk and their exposure insurers may choose not to insure in very high risk areas.

Flooding is of particular concern to insurers as many of the insurers are Australian-owned and therefore have recently been exposed to bad flooding in Queensland and elsewhere in Australia. In addition, concern about future risks may also exacerbate this situation as it may expose additional areas to flood risk or increase the frequency or severity of areas already at risk. It also raises uncertainties in forecasting risks which insurers may be keen to avoid.

The lack of availability of insurance in high risk areas will of course impact all groups including older residents. However, older residents may be disproportionately impacted. Those on fixed incomes will be less able to self-insure and build up their own funds to recover from flooding: although many may have strong family and other social networks to assist in recovery.

Insurers may decide to withdraw cover on new risks in the first instance in order to prevent their overall exposure from increasing. This may mean refusing to cover new property built in areas at risk of flooding, which also sends a message to planners and environmental courts that permitting development in these areas is not a good idea – it may also serve as a deterrent to developers as it will be difficult for them to sell properties where residents will struggle to acquire a mortgage (see also Section 7.3.3).

Threatening unavailability of cover is also an element which may encourage more mitigation as residents of all groups may seek to reduce their risk and therefore not only lower their risk but also encourage insurers to offer them cover. However, there are many barriers to mitigation and the potential problems for older people are explained below (Section 7.3.6) and thereby older people may need to be targeted to assist them in assessing the options to reduce their risk

7.3.3 Increasing exposure of older people to flood risks

Issues of the continued availability and affordability of flood risk insurance have been discussed in previous sections and both may prove to be potential barriers to the resilience of older people in the future. It therefore makes sense to take measures to try not to increase the numbers of older people residing in areas at risk of flooding: and in particular in areas of very high risk. Those already located in flood risk are difficult to influence, but it is easier to impact new development and in particular try to prevent the construction of properties targeted at older people (such as retirement villages) in areas of very high risk. Those interviewed by this study were concerned that such developments were occurring on flood prone land and despite the objections of local councils; thereby exposing future residents to flood risk. Where development of these villages cannot be avoided, required mitigation should be introduced to reduce the risk to an acceptable standard and developers (and latterly village operators) should be held responsible and monitored to ensure that they are fulfilling their responsibilities. Future residents have the potential to be able to influence this process if retirement village owners were required to formally declare the risks that a village faces as part of the registration process and the mandatory independent legal advice: the potential influence of disclosure is discussed in more detail in Section 7.3.8.

7.3.4 Other barriers or disincentives to the uptake of insurance for older citizens in New Zealand

Both the availability and affordability have been highlighted as potential reasons why older people (and other New Zealand citizens) may not benefit from the financial resilience that insurance provides. However, there are other potential

barriers to the uptake of flood insurance and these may become more significant in the future.

The first barrier relates to the ties between home ownership and high rates of insurance penetration. House prices are generally increasing in New Zealand and coupled with demographic changes this situation is leading to much lower rates of home ownership: thus leading to the potential erosion of the traditional culture of having household insurance. The insurance industry is generally concerned about this trend and as a result of these changes is expecting household insurance penetration rates to decrease in the future as it removes the compulsory element of having building insurance if there is a mortgage. This situation does not appear to be impacting on older people at the moment however will begin to have an impact over the next 20 years. Indeed, Tuohy (2010) highlighted through survey analysis that the rates of insurance penetration amongst older people[46] increased between 2006 and 2008 from 84.5% to 88.7%. Although this situation is not directly impacting on older people at the moment it may impact on older people in the future.

Additionally, older people with insurance will be affected by any changes to the insurance market caused by a reduction in penetration rates across the industry. In practice, this means that risks will be spread over fewer people and depending on the nature of the risks that remain on their books may lead to insurers re-evaluating their exposure and may necessitate an increase in all premiums to account for this reduction in risk spreading.

A second barrier relates to the nature of insurance sales and the communication between the insurer and policyholder. Insurers are increasingly relying on electronic transactions and have closed many of their local insurance branches. This may create an obstacle to some older people from accessing coverage or at least getting the best deal for their insurance premium (potentially causing problems of affordability or even availability). This problem is exacerbated by the adoption of the sum-insured system which is a more difficult process and much of the related consumer information and guidance is held online. Insurance brokers may still have a large role to play in assisting these groups in obtaining insurance. In addition to using electronic methods at the time of purchase, insurers report that they are also increasingly using the internet and email to communicate with policyholders as a reduction in the numbers of people working in the industry means that there are insufficient personnel within the industry for personal contact. These issues also prevail at the time of a claim (see Section 7.3.5 for further comment). Older people are often a group disadvantaged when there is a dominance of electronic communication. Indeed, a survey conducted by the NZ Office of the Auditor General (2012) suggested that older people were considerably less likely both to have home internet access (76% of 65 to 74years and 52% of over 75 years compared to the national average of c. 85%) or to be a recent internet user (61% of 65 to 74years and 32% of over 75 years compared to the national average of c. 85-90%).

7.3.5 Ensuring the effectiveness of insurance as a financial resilience mechanism for older people

Insurance remains the most relevant and appropriate mechanism for increasing the financial resilience of older people to natural hazards and therefore it is essential to ensure that older people have adequate coverage, maintain adequate coverage and finally utilise that coverage when required. Even when older people take out insurance cover to act as a mechanism to provide financial resilience from flooding (and other natural hazards) it may not always be as effective. This section explores these reasons and proposes actions that might be taken to reduce them.

Firstly, older residents may decide not to claim following an event which may hinder their recovery from an event. There may be a number of reasons why residents may not claim. They may make a conscious decision that they can afford to cover the losses and thereby do not want to lose any no claims bonuses or suffer any premium increases that may result. This situation should not affect the resilience of these older residents as they have made a conscious choice. However, there may be situations where policyholders are afraid of the unknown and of potential premium increases as a result of making claims and may lead to residents not claiming and thereby suffering a loss as a result. In these circumstances, more information about the impact of claims on future premiums could be made more explicit to ease potential worries.

[46] Tuohy considered the group between 54 years and 70 years.

Additionally, older residents may in some cases require additional assistance in coordinating claims and to better understand for what they are permitted to claim. Evidence following the flooding in Sheffield (UK) in 2007 highlighted that older people had difficulty navigating the complexities of insurance claims and felt that they were unfairly treated by some insurance companies who they accused of not listening to their opinions (Walker, 2009). In the case of New Zealand, this may be most problematic when long term recovery is needed and in particular when it is necessary for claims from both the EQC and from a private insurer which if there are complexities may cause confusion for residents. Indeed, in order to speed up payments following the Canterbury earthquakes cash settlements were provided for the lower claims although this permitted residents to receive recompense more quickly it also removed the assistance that insurers provide policyholders in organising repairs. Some older people may struggle with aspects such as engaging and managing builders (particularly at times when there may be a shortage of labour and materials etc.) as well as managing issues such as compliance etc. Thereby, as an insurer is contractually obligated to reinstate a property, it is in the interest of older residents not to accept a cash settlement (and thereby they should not be advised to do so) as it means being burdened with the complexity of managing the repairs and rebuilding themselves. The disadvantage of this would mean that they had to wait longer (potentially in temporary accommodation) for recovery activities to be completed.

Older people are not only impacted in terms of engaging builders but they might also be impacted by anti-competitive behaviour of the building industry. Following some natural disasters in New Zealand (particularly the Canterbury earthquakes) many problems within the building industry have been observed including in relation to productivity, the occurrence of poor practices such as 'cover bidding', high levels of bankruptcy and the high closure (and subsequent reopening as a different business) of building companies to avoid any liabilities that may emerge. These practices impact not only on older people, but impact upon the whole insurance industry and its ability to deliver affordable premiums to all householders. The Commerce Commission NZ is aiming to tackle many of these problems and increase the compliance of the building industry in following consumer and competition legislation (NZ Commerce Commission Press Release, 2014).

It might be possible in the future for insurers to try to prioritise vulnerable people (including some older residents) when considering rebuilding activities. Walker (2009) suggested that providing a local advocate to assist local people (and other vulnerable groups) as well as ensuring that representatives from the insurance companies liaised more closely with older people to discuss and explain the claims process. These types of activities have been implemented following the Canterbury earthquakes as each claimant has a claims manager; however for smaller events this might not be as effectively implemented. The ICNZ have been proactive in the past following events and have set up community drop in centres. Although these do make a difference they will only have limited capacity and only be able to remain in place for a short period of time and recovery from flooding can typically take months or years. Additionally, older people with health or mobility problems may not be able to visit these drop-in centres and miss the opportunity for assistance. Therefore, perhaps the ICNZ could continue these efforts and work with affected communities and insurers to particularly target older people to see if they require claims assistance.

The effectiveness of insurance may also be threatened when adequate coverage is not taken out. The move to a sum insured is quite a change for policyholders and will be equally so for older residents. Under the new system there is the potential for people to underinsure both their building and the contents and thereby reduce the amount that they will receive following a claim. Although as discussed in Section 5.3.1.2 the prohibition of the 'condition of average' will mean that this may not have such as impact as in other countries. Nevertheless the impact of underinsurance may still be significant. Companies providing valuation assistance have emerged in New Zealand following the change to the sum insured which may in some cases limit the potential for underinsurance; however this may also be adding another cost when purchasing insurance and again lead to affordability issues. In these situations it is likely that policyholders will make their own judgements and may be more likely to be exposed to underinsurance as a result. In particular if there is a large disparity between the actual value and the insured value then it may

be difficult for residents to fully recover following an event: particularly in the case of a total loss. Older people may be significantly affected as they will have both limited time and funds to recover. Furthermore, as discussed above there is evidence to suggest that older people in the past have also under-claimed following experiencing damages from adverse natural events.

Additionally, with an increased awareness of the risk insurers may not only increase premiums but also introduce other mechanisms to reduce their losses (i.e. introduce higher or separate deductibles for flooding or even mitigation action) and older people may require additional assistance in understanding changing (and potentially more complicated) insurance products to ensure that they are fully and adequately covered. As insurers are moving towards a system based more on electronic communication older residents may require alternative approaches to be implemented.

7.3.6 Increasing insurance-incentivised flood mitigation

Currently, there are few ties between flood mitigation and insurance cover in New Zealand and there is high potential for insurance to assist in increasing the resilience of older people through mitigation. Before discussing how insurance may be used to promote and enhance flood resilience it is pertinent to discuss the current barriers to uptake.

Awareness of flood risk is currently a barrier to uptake of measures to reduce risk: as a policyholder will not mitigate if they do not know they are at risk. Firstly, insurance may be used as a mechanism for raising awareness about flood risk. At time of renewal insurers contact their policyholders and this annual opportunity could be used to deliver information (or where to find information) about their risks. Although for competitive issues insurers are unlikely to provide information about the specific premiums being associated with flood risk (i.e. if premiums are introduced to reflect the risks) this would give a policyholder some idea about the level of their risk; perhaps a system of banding (high, medium or low) could be used to achieve this. CRESA has developed a tool to assist older citizens in appreciating the natural risks that they face. The Home Site Selection Guide provides a framework for older people to use when selecting a retirement location and provides information about the types of hazards that they face and where to look or who to ask about the risk levels at potential sites. This tool will assist in raising awareness of the potential risks and enable older people to make balanced and considered decisions when investing their retirement capital into properties. It might also be used to assist these new residents relocating into risk areas (and potentially existing residents) to consider their potential insurance needs and making sure that they have sufficient coverage to secure their financial recovery if an event were to occur.

Cost is often a barrier to mitigation. Currently, there is a lack of assistance in the implementation of property-level measures. Following the floods in winter 2013/2014 the UK Government has implemented a scheme of Repair and Renew grants of up to £5,000 to flooded households to fund additional flood resilience or resistance measures for homes and businesses (HM Government, 2014). The rationale is that these are provided in addition to the insurance pay out and are specifically intended to be used to make a property more resilient or resistant to flooding in the future. Potential suggested measures include: waterproofing external walls, the installation of sump pumps and demountable door guards. A scheme of this type might be considered in New Zealand although will of course only have an impact on properties that have flooded rather than all properties at risk.

A further barrier is the awareness of the potential options for managing flood risk. This is a very difficult area for any residents and older people may require additional assistance. As discussed in Section 5.3.2, options for mitigation are inherently complicated by the typical type of construction (timber framed) which means that resistance measures are generally difficult to implement. However, resilience measures are possible (as highlighted in the inset box in Section 5.3.2). However residents require assistance to select the type of measures that may be suitable for their type of property. In the UK Defra have recently developed a simple tool to assist residents in understanding the potential options for reducing their flood risk and provide some indicative costs. For the first time, the Property Protection Advisor[47] allows people to estimate just how much it will cost to protect their home from flooding

[47] http://nationalfloodforum.org.uk/flood-protection-adviser/

using flood protection products. After entering basic details about their property, such as the type of construction and the number of rooms, the Advisor will produce an instant tailored online report for a householder, estimating what it would cost them to reduce that risk. Additionally, information is also available about companies who provide these products and also a directory of qualified Property-Level-Protection surveyors, professionals who are able to assist in understanding these measures and their benefits. It will also make recommendations about work a householder could consider and direct them to further advice. Similar approaches could be developed and tailored to deal with the risks in New Zealand; although it should also be provided in an accessible way to older people.

Reducing losses from flooding does not necessarily only have to come from mitigation action and a reduction of the flood risk. The moving and evacuation of contents also has the impact of reducing loss and can be significant if precious possessions are targeted. One might potentially expect older residents to be able to save less than other residents: however there is evidence to suggest that the damages saved from the properties of older residents were not higher than those inhabited by younger people (Parker et al., 2007). This was because these residents often received more outside assistance (friends, family and neighbours) in moving property out of the path of floodwaters.

The main incentive barrier to the uptake of mitigation is potentially changing. At the moment the low premiums mean that there is not the scope to incentivise but with the move to higher premiums there is much more scope with which to incentivise mitigation. This may mean that insurers may offer premium reductions or may offer cover when they were considering withdrawing it, if residents take action to reduce their flood risk. However, the measure would need to be something seen as proven and sustainable in the eyes of insurers. This may create a potential disadvantage for older people. Currently in New Zealand the main way of mitigating flood risk is to raise the floor height of properties or to make the living space of houses on the upper floors. This 'accepted' and recognised type of flood mitigation may not be suitable for older residents with mobility issues. Therefore, there is the need for the insurance industry to engage with other options for flood risk reduction more suitable to the needs of older citizens to ensure that they are not disadvantaged in insurance coverage. This may occur anyway if flood risk premiums increase and options for flood risk mitigation are explored.

7.3.7 The impact of potential changes to the EQCover on older people's resilience to flooding

Section 5.2.7 describes some potential changes to the EQCover that may occur as the result of a NZ Treasury Review and all of these will impact upon older people in the same way as other residents with insurance. Similar to other residents, the removal of cover for land may make residents less resilient to the impacts of flooding in the future and it is unlikely that the private insurance market will pick up these risks. Additionally, the complexity of insurance provision may increase (i.e. excess changes, differential premiums etc.) making understanding the system potentially more complicated for all citizens. Furthermore, it is likely that changes may lead to increased premiums for some residents and thereby relates to the affordability issues discussed previously which may be particularly pronounced for older people who are potentially on fixed incomes.

When consulting, reporting and explaining potential changes to the EQC scheme and the balance between this cover and private insurance, the Earthquake Commission should recognise that all communication should be accessible to older people and there should not be a reliance on electronic mechanisms. It is difficult to predict the specific implications for older people without the specific changes being finalised.

7.3.8 The case of flood insurance cover for retirement villages and their residents

Currently there is no requirement for disclosure of floods (or other) risks; however the current COP requires that details of insurance cover be provided to a resident or prospective resident if requested. So if there are any particular risks attached to a policy then these would be listed and visible to the resident. Improving the disclosure of flood risk for those purchasing properties or moving into retirement villages would enable a more considered and conscious decision about flood risk and also increases the awareness that mitigation may be required. Where retirement villages are concerned this might be added as a

specific clause on a contract agreement which would need to be discussed by the independent legal advisor prior to a resident joining a village.

The mandatory independent legal advice may be having an impact as there is evidence to suggest that this advice has included suggesting that residents consider their own insurance needed; however there is no requirement for a resident to take their advice or take out cover and so the true impact of these elements is difficult to determine.

What is likely to be more influential is the requirement for village insurance coverage to be to the satisfaction of the Statutory Supervisor. Although there is much work to do to ensure that SSs understand their obligations and what constitutes adequate coverage it is likely that over time this should ensure that all village operators are property covered and thereby residents investments fully protected. Despite having adequate coverage this will not prevent hazards and residents may still have the stress, anxiety and inconvenience of being out of their homes.

More emphasis should be placed on mitigating those risks that it is possible to mitigate; which would not only potentially reduce the premiums of residents (for contents insurance) and reduce the chances of exposing them to flooding but also reducing the premiums of the village operator. With likely increases in premiums linked to the knowledge of the flood risk there will be more scope to incentivise action. Villages of this kind might be targeted by campaigns or assistance to promote flood mitigation options as by doing so will improve the resilience of a large number of older people and may have more impact than targeting individual properties. In particular, for newly built villages in flood prone areas it may be possible to require flood risk reduction measures to be implemented.

As discussed in Section 5.4, there is a contract between residents and the village operator and as such there is some legal protection of the financial interests of the residents. There have been some efforts to progressively regulate aspects of the industry as the public costs of poor provision and management have risen. However, more needs to be done in this area to ensure that the legislation is clear and effectively empowers residents. Currently, residents are able to influence activities through raising areas of concern with village operators; but it is unclear how many are actually doing so and the effectiveness of this action in changes in practices. This informal process does not guarantee any action, however operators may want to be seen to be resolving conflicts in order to satisfy residents and ensure that a village remains attractive to prospective new residents. Additionally, a good and proactive Statutory Supervisor may also be able to draw the attention of village owners to these types of issues. However, ultimately any flood risk reduction activities are likely to be influenced by the costs of interventions.

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Appendix A: Examples of international provision of flood insurance

A1 European countries

This section will provide an international comparison of countries in Europe. Many of these countries are Members States of the European Union (Austria, Belgium, Denmark, France, Germany, Hungary, Italy, The Netherlands, Poland, Portugal, Romania, Spain, Sweden and United Kingdom) and therefore they will be subject to some EU Directives and Regulations which affect how and whether flood insurance is provided.

The first aspect relates to the free trade conditions between EU countries and regulations related to competition between companies (European Union, 1992). This has had a number of impacts on the provision of flood insurance. First, the regulations (in particular the EU Directive on non-life insurance: European Union, 1992) have affected pre-existing insurance monopolies (Porrini and Schwarze, 2014). These existed in a number of regions (e.g. Baden-Württemberg, Germany), whereby household insurance (including flood) was compulsory and penetration was consequently high. The new EU regulations have led to the cancellation of some of these systems and insurance 'cartels' and although alternatives through the private market are available – they are generally not compulsory- and therefore insurance penetration has reduced as a result (Fiselier and Oosterberg, 2004).

Competition regulation is also often provided as a reason why insurers find it difficult to introduce actions prompting mitigation or insisting that flooded properties are repaired and replaced to higher standards (retrofitting for flood resilience/resistance). Priest (2003) argues that many insist that they would need to work together and come to an agreement in order to be able to ensure that they are not undercut by other insurance companies; as other insurers may choose not to insist on mitigation and therefore take on this business. However, companies are unable to act together as this would be against competition and anti-monopoly legislation which prevents any activities considered to be anti-competitive.

However, not all of the consequences of EU Competition regulations have been negative. Under these regulations there are also conditions which aim to prevent the binding agreements to exclude particular perils (such as flooding) from insurance cover. This was a situation in The Netherlands where insurers had a binding agreement to prevent the cover of flooding. As Faure and Hartlief (2006) report the conditions of EU regulation 3932/92 report that "standard policy conditions may in particular not contain any systematic exclusion of specific types of risk without providing for the express possibility of including that cover by agreement" (EEC, 1992; Consideration 8). This was resolved in The Netherlands by the alteration of the agreement to being non-binding which has paved the way for the introduction of a new insurance projects (Section A1.9).

In addition to competition legislation having a large impact upon the actions and activities of insurance companies in EU Member States, another key EU Directive is Solvency II (The European Parliament and of the Council, 2009). This replaces a previous Directive, Solvency I, which was introduced in 1973 and is a risk management device which aims to further codify the amount of capital that insurance companies in the EU must hold in order to avoid insolvency. Introduced in 2009, it is currently still being implemented and transposed into the national legislation of EU Member States and the implications of the Directive are still to be understood. However, the aim of the Directive is to ensure that an insurer will be able to meet their claims and ultimately provide a greater confidence in the insurance industry (Matt Cullen, Association of British Insurers, pers. comm.). Although the detail of how the Directive will be implemented is specific to transposition legislation of the particular Member State, it obliges insurers to have a greater knowledge of their exposure (at probability 1 in 200 years) to different risks (all risks not just natural perils) and ensure that they have sufficient reserve capital. These requirements mean that insurers may begin to question their exposure to natural perils (including flood insurance) and take action to better manage their risk. This may mean that some insurers will seek to limit, reduce or avoid the very high flood risks and start to change their terms and conditions. The true implications of Solvency II on flood insurance however will begin to unfold as the deadlines for each stage of implementation elapses.

There are also additional resources available to EU Member States that they may be able to draw

upon following flooding to provide financial assistance for recovery activities; the most significant of which is the EU Solidarity Fund.

A1.1 EU Solidarity Fund

As well as being able to draw on national reserves and the global insurance and reinsurance market, Member States of the European Union are eligible to apply for financial aid from the European Union Solidarity Fund (EUSF) in the event of major natural disasters including flooding (Council of the European Union, 2002). However, the terms at which the EUSF can be invoked are quite strict and it was only intended to provide relief in the more severe of circumstances. Specifically, Article 2 of the EU Council Regulation states that "A 'major disaster' within the meaning of this Regulation means any disaster resulting, in at least one of the States concerned, in damage estimated either at over €3 billion in 2002 prices, or more than 0,6 % of its Gross National Income" (Council of the European Union, 2002; L311/5). Member states receive assistance in the form of a grant for risks which are uninsurable and the aim of the Fund is to assist and complement the efforts of the States and to enable them to undertake emergency operations (e.g. temporary accommodations, immediate restoration work and the clean-up of affected areas. The fund is financed outside of normal EU funding and the fund has an annual ceiling of €1 billion (European Commission, 2011).

Of the 52 EUSF Interventions since 2002 (European Commission, 2013) the majority (a total of 32) were for floods events (or mixed storm and flood events) with a total amount provided in funding of €1.36 billion. More specific information is provided in Table A1. The regulations relating to the EUSF are under review however (European Commission, 2011). A key feature of the review is to increase the ability of the fund to be able to response more rapidly at the time of disaster, partly through adopting more simple definitions of when a flood occurs. In addition, the Commission are eager to ensure that countries are undertaking activities to reduce their risks to natural disasters.

Table A1: EU Solidarity Fund Interventions since 2002 for flood events (between November 2002 to April 2013)

Country	Flood event	Total event damages (million €)	Received from the EU Solidarity Fund (million €)
Austria	August 2002	2 900	134
Czech Republic	August 2002	2 300	129
Germany	August 2002	9 100	444
France	September 2002 (Gard)	835	21
Malta	September 2003 (Storm and floods)	30	0.96
France	December 2003(Vallée du Rhône)	785	19.6
Romania	April 2005 (Spring floods)	489	18.8
Bulgaria	May 2005	222	9.7
Romania	July 2005 (Summer floods)	1 050	52.4
Austria	August 2005 (Tyrol, Vorarlberg)	592	14.8
Bulgaria	August 2005	237	10.6
Greece	March 2006(Evros)	372	9.3
Hungary	April 2006	519	15.1
United Kingdom	June 2007	4 612	162.3
Slovenia	September 2007	233	8.3
Romania	July 2008	471	11.8
Ireland	November 2009	521	13
Portugal	February 2010 (Madeira floods and landslides)	1 080	31.3
Croatia	May 2010	153	3.8
Czech Republic	May 2010	205	5.1
Hungary	May 2010	719	22.5
Poland	May 2010	2 994	105.6
Slovakia	May 2010	650	20.4
Romania	June 2010	876	25.0
Czech Republic	August 2010	437	10.9
Croatia	September 2010	47	1.2
Slovenia	September 2010	251	7.5
Italy	October 2010 (Veneto)	676	16.9
Italy	October 2011 (Liguria & Tuscany)	722.5	18.1
Croatia	October 2012	11.5	0.29
Slovenia	October 2012	360	14.1
Austria	November 2012 (Lavamünd)	9.6	0.24
	Total	34,459.6	1,357.6

Source: European Commission (2013)

A1.2 Austria

Insurance cover for natural hazards is optional and insurance penetration for domestic properties is low. Where cover is offered and purchased it is via by the private market as a bundled policy along with other natural perils (including landslide, debris flow, avalanche and earthquake); although storm is handled differently. There are also quite unfavourable indemnification limits which on standard cover can cap pay-outs between 25% and 50% of the building cost or a maximum value of between €3700 and €7500 (c. NZ$5,965 and NZ$ 12,091) (CCS, 2008). It is possible to purchase policies which are based upon a risk assessment of the household which will provide higher levels of indemnification, but the premiums will also be higher to reflect the increased risk. Additionally, many standard policies have a composite accumulation clause which means that insurers will set a maximum amount that those insured are able to claim from the same policy for the same peril (Holub et al., 2011).

Paklina (2003) suggested that in Austria the penetration rate was less than 10%. CCS (2008) identify that one of the key risks to the system is adverse-selection as demand is understandably highest in those areas where flooding is frequent, thereby raising the cost of premiums and reducing the penetration rates. This situation results in a very low percentage of flood losses being recoverable through insurance: this was considered only to be c. 15% for the 2002 floods. There has been some discussion about altering the insurance system further so that there is higher penetration and more floods are covered but the insurance authorities have recognised that "It is only in a risk partnership with the State that insurance solutions can be found" (VVO, 2005) and that a fundamental change to the current system is necessary.

Recovery from flooding in Austria is primarily based on disaster relief (*Katastrophenfond*s) provided by the National Government (Fiselier and Oosterberg, 2004). To provide financing of the disaster fund, tied surcharges were placed on income taxes, wage taxes, capital gains tax and corporation tax. After being subject to several amendments, the legal act from 1966 was revised by the so-called Federal Act related to the Disaster Fund of 1996 which is still in force (Republik Osterreich, 1996). The budget of the disaster fund originates from a defined percentage (since 1996: 1.1%) of the federal share of the aforementioned taxes which amounts to approximately €7(c. NZ$ 11) for private households and€30 (c. NZ$ 48) for business entities per year (Vetters and Prettenthaler, 2004).Porrini and Schwarze (2014) argue that citizens do not have a legal right to access these funds and if their request for aid is granted it only covers approximately 50% of the damages incurred.

Funds which are not spent in a respective year are subject to a reserve. In accordance with the Austrian Court of Audit, the prescribed maximum reserve of the disaster fund is limited to €29 million (Federal Ministry of Finance, 2006, Republik Österreich 1996). This regulation has resulted in a redistribution of these additional funds to other areas of the budget when they are not needed to recover from catastrophic events. This is considered to be one of the major stresses on liquidity of the disaster fund if above-average losses occur (Holub and Fuchs, 2009).

Additional funds are also available from the Federal government and also the EU solidarity fund (see above section) to compensate from flooding events. Although each of the Regional governments are free to implement their own rules (within the bounds of the 1996 act (T. Thaler, pers. comm.)) in general a regional government will grant an indemnity for the losses incurred by private households and companies up to 20-30%. Regional governments are then able to recover c. 60% of those funds spent on financial aid from the National Disaster Fund (Federal Ministry of Finance, 2006).

The 2002 event serves to highlight the role of public financial aid following flooding. A Statute on the Compensation for Victims of Floods and Reconstruction[1] was passed to be able to add to the funds in the central Disaster Fund. In 2002, €500 million (c. NZ$ 806 million) was approved as compensation from the Federal fund, of which half was to be used for the damage of property of private citizens and businesses (Hinghofer-Szalkay and Koch, 2006). Additionally, they report that other instruments were also used to aid and assist recovery including subsidies for small businesses and a social hardship fund. Although it is possible

[1]the *Hochwasseropferentschädigungs- und Wiederaufbau-Gesetz*

to say how much compensation was given to individual households in 2002, there is no set amount how much funding should go to individuals and it is possible that this varies between different events (T. Thaler, pers. comm.).

It is pertinent to ask whether a household would be able to receive Federal Compensation *and* claim on their insurance policy. Hinghofer-Szalkay and Koch (2006) suggest that an insurer does not ask whether a householder is seeking recompense from public funds, but conversely any request for public assistance will ask whether an individual has private insurance. Since there can be quite strict upper limits on indemnities (including cumulative limits on payments received) and thereby not all the losses are covered, it may be feasible that a homeowner receive an insurance pay-out and still be eligible to receive some compensation.

There was some concern following large flooding events (such as those experienced in Austria in 2002) that the current disaster relief fund was insufficient to provide that level of compensation. Therefore, a national law was enforced that enabled higher subsidies in individual circumstances such as the 2005 events (Republik Österreich, 2005) and new system based on allowing those who have suffered property damages to obtain tax-relief as a form of compensation was considered. However, an overall system of obligatory buildings insurance is still missing in Austria so far (Holub et al., 2011)

Key Characteristics: Austria	
Insurance scheme:	Private insurance is available and optional – some bundling with other perils.
Types of perils and flooding covered by insurance:	Unknown.
Optional/ compulsory cover:	Where insurance is available it is optional.
Insurance premium mechanism:	Flooding is included along with some other natural perils.
Risk transfer mechanism:	As low penetration – open to anti-selection but some bundling via other perils.
Penetration/ coverage of flood insurance:	Low penetration of insurance.
Presence of state aid or compensation:	National solidarity disaster relief. This is provided by an Act of Parliament and therefore enshrined in legislation.
Summary:	Most recovery is through the National Catastrophe Fund as insurance penetration is low.
Key principles of the recovery system	
Efficiency:	An upper limit on indemnification may incentivise mitigation and a reduction in overall damages. Also increasing use of building codes but how these relate specifically to flooding is unknown.
Equity principle:	*National solidaristic* whereby all are contributing via subsidies on taxation.
Robustness of recovery system:	*Medium* - as although losses are spread via taxes and there is an upper limit on indemnification – but susceptible when there are large floods with high losses.

A1.3 Belgium

A National Calamities Fund was initially established by the State in 1976 to provide some compensation from losses in the event of natural disasters. CCS (2008; 35) argue that it exists to contribute to assisting losses to private property "by natural event of exceptional intensity and generalised devastating effects, fundamentally for risks which are hard to insure (flood, earthquake)". This State-backed fund is in effect publically financed through different budgetary mechanisms collected when needed following a disastrous event. A disaster has to be declared by a Royal Decree which sets the geographic area in which the law is applied (Durant, 2006). There is also the specific requirements that: the event is exceptional, total direct damages exceed €1.25 million (c. NZ$ 2 million) with an average damage claim exceeding €5,000 (c. NZ$ 8,061) (CCS, 2008). Losses are adjusted by the State and are compensated at the real value of the loss with a deductible of €250 (c. NZ$ 403). However, the role of the Fund is changing due to increasing demands and losses occurring and the country has moved towards an insurance-oriented approach; importantly any risk which can normally be covered by an insurance policy will not receive any financial aid via the Fund (Durant, 2006). The Fund is financed by a number of mechanisms including advances of the Treasury, public donations, investment incomes or short term loans to the Fund (Durant, 2006).

Belgium has adopted a system of disaster cover which provides insurance for flood-related losses as part of simple-risk fire insurance policies. The original was originally implemented in 2003 and was restricted solely to flooding and only those properties at flood risk, which of course does not efficiently and effectively adopt the principles of insurance. It was therefore amended in 2005 and a compulsory flood guarantee was placed on all fire-policies irrespective of the flood risk of the property as well as extending the requirement to include other perils such as earthquakes, overflow or blockage of public drainage and landslides or subsidence (CCS 2008) (Act of 17 September 2005, changes into force as of 2 March 2006). Cover is administered and sold via private insurers however an insurers' exposure is limited by the total amount of cover they underwrite and per event. Any losses above these limits are covered by the National Calamities Fund up to a total of €280 million (c. NZ$ 451 million) (for floods) with monies received from a claim being reduced proportionally if this limit is reached. The National Disaster Relief Fund is composed of two funds: the Disaster Fund which is for general disasters including floods and the second dedicated to disasters affecting the agricultural sector. These funds have elements of both pre and post-event financing. The Disaster Fund can be considered to be *ex ante* because it manages a continuous flow of finance for its operational costs (gathered from multiple sources including national lottery, investment income and taxation on insurance policies); however the fund often also relies on additional (ex post) funding if the balance of the Fund proves inadequate. This additional money comes from the National Treasury and also contributions from the budget of the Ministry of Finance.

The policies have deductibles applied but these are limited by the legislation and in 2005 were around €1000 per claim (c. NZ$ 1,612) (CCS, 2008). For the very highest risks areas for which high premiums or deductibles would make the insurance unaffordable a 'Tariffs Office' is established to specify the relevant ratings and the tariffs are distributed amongst all insurers (CCS, 2008). The system has the advantage that there now a much higher penetration of flood insurance cover in Belgium and greater degree of solidarity amongst policyholders.

The 2005 Act has a clause which aims to mitigate further development in flood risk areas as insurers have the power to refuse cover to new properties (or contents of properties) constructed in areas designated as being at risk. There is also a stipulation that the state, regional and local government tries to prevent construction permits being issued in flood-risk areas which has required improvement in flood risk assessments and the locations of high risk areas. The main piece of legislation stems from the federal level, and applies equally to the Flemish Region, the Walloon Region and the Brussels Capital Region. This Royal Decree of 28 February 2007 (Belgian Official Journal of 23 March 2007) delineated the areas that are at risk of flooding of which the cartography in the Walloon Region was refined and modified by a further Royal degree of 6March 2008. In addition to this, the Regions are also responsible for identifying and delineating the areas at high risk of flooding according to the rules established at a Federal level (Royal Decree of 12 October

2005), although this has yet to be achieved in the Brussels Capital Region.

It should be noted that the maps delineating the zones at high risk of flooding are different from the maps delineating flood sensitive areas (e.g. in the Flemish Region). The latter are used as an instrument by the authority granting a building permit, more specifically in the application of the water test. The insurance coverage restrictions only apply on the basis of the maps delineating the high-risk zones on the basis of the Royal Decree of 28 February 2007. For those buildings that have been constructed in the high-risk areas after the date of 23 September 2008 (18 months upon publication of the Royal Decree determining the high-risk zones), insurers are not obligated to cover the building for water damages. If the insurer does decide to insure said building, the maximum tariffs of the "Tariff Office" are no longer applicable. As a consequence, the cost of the premium is at the discretion of the insurer and a risk-related premium can be charged where desirable. Also, the owner of the building is no longer entitled to benefit from the intervention of the Calamities Fund. An insurer might also stipulate that a property-owner is required to prove that they have taken a series of important preventative measures in order to limit risks of flooding. However, this option is not anchored into the legal framework. These restrictions do not apply if the building already existed prior to 23 September 2008; for these buildings the maximum tariffs as set out by the Tariff Office apply.

Since 2013, the Disaster Fund is in the process of being regionalised, rather than being undertaken at a national level. However it is not yet clear what impact this will have on compensation and how the fund will function

Key Characteristics: Belgium	
Insurance scheme:	Private insurance – as part of fire policies and bundled with other natural perils, but is backed by the government.
Types of perils and flooding covered by insurance:	Unknown.
Optional/ compulsory cover:	In effect optional as although flood cover is compulsory on all fire policies; fire policies are themselves optional.
Insurance premium mechanism:	Bundled with other perils – some actuarial elements.
Risk transfer mechanism:	Bundled – therefore subsidised and transferred across risk categories.
Penetration/ coverage of flood insurance:	Unknown – though of course higher than it was prior to 2005.
Presence of state aid or compensation:	State-backed National Calamities Fund – but only for uninsured risks and therefore unlikely to be available for flooding.
Summary:	A mixed system whereby the government is backing recovery via insurance, rather than via compensation.
Key principles of the recovery system	
Efficiency:	Possibility to refuse cover on grounds of inappropriate development – but few clear ties to mitigation activities.
Equity principle:	*Solidarity* amongst policyholders.
Robustness of recovery system:	*Medium* to *High* – Compulsory cover means high penetration and limiting of exposure but is relatively risk-insensitive.

A1.4 Denmark

Insurance cover is available in Denmark for all types of flood, storm and hail damage. Flooding from the sea is compulsory, whereas all of the other types of flood insurance are optional (CCS, 2008). The compulsory flood insurance includes all sectors (domestic, commercial, agricultural and industrial) and two elements specify the scope of the insurance cover:

- Flooding must be caused by seawater, and
- The intrusion of salt water must have been due to a rise in sea level caused by a cyclonic (storm) event.

Cover is specified by the 2000 Act No. 349 *Compensation for Damages Caused by Storm* (replacing the original 1991 Act No. 340) and is administered by the Storm Council, a Danish State body, which makes the judgement about whether a flood event satisfies the two conditions specified above. The insurance cover is guaranteed by the State and must be included within fire insurance policies (excluding boats and vehicles) (Machetti, 2009) although it appears that the insurance is only available for properties which are not able to procure flood insurance cover via the private market. As well as this exclusion, there are many others which include both the type of damages which are insured as well as mechanisms which aim to introduce better management of flooding and a reduction in future flood losses. CCS (2008) discusses the following key exclusions in which cover may be reduced or refused:

- The contents of basements, cellars and underground premises
- Indirect damages
- Damage to land
- Personal damage
- To property constructed in areas known in advance to be of high risk
- The property contributed or worsened the damage because of a failure to comply with building legislation – e.g. the use of inappropriate materials, inadequate design or maintenance of the property
- Damage was intentionally worsened or could have been avoided or limited

Importantly, the Act may require property owners who have suffered flood damage in the past to take preventative measures if they are going to continue to be entitled to compensation in the future.

The cover is funded by a levy surcharge of DKK 20 (c. NZ$ 4.33) which is placed upon all property fire and other flood insurance policies collected by the private insurers and transferred to the Storm Council. All other aspects of the policies are administered by the private insurance company (e.g. issuing of policy, appraisal of damages, and collection of premiums and receipt of claims for the loss). However, from a legal perspective there is no contract between a property owner and an insurance company with regards to the cover for seawater flooding; that responsibility passes to the Storm Council. Although claims are administered by the private insurer, the Storm Council makes the judgement about whether the claim is valid and the amount of compensation to be paid. There is a general deductible on the policy of a minimum of DKK 5000 (c. NZ$ 1,082) or 5% of the losses for single or two-family properties or 10% (minimum DKK 10,000 (c. NZ$ 2,163)) for other properties.

The Danish Government provide a limited guarantee for the scheme and will provide an additional DKK 200 million (c. NZ$ 43.3 million) if there are insufficient funds collected by the Storm Council to settle claims. However, there is a provision to recover these additional losses (including interest) by increasing (by DKK 10; c. NZ$ 2.2) the surcharge placed on all fire and flood insurance policies. There is an increasing concern that under climate change losses attributed to seawater flooding due to storms is increasing and that the provisions in the 1991 and 2000 Act is insufficient to continue to cover these losses (CCS, 2008). Additionally, severe flooding due to heavy rainfall in summer 2007 caused significant losses and there are increasing discussions about whether river flooding should also be included within the provisions of the Act.

For other types of flooding and storm damage insurance is all provided by the private market although there are many variations on how insurance cover is offered. A separate policy covering flood damage may be offered or cover may be attached to a main policy. Additionally, cover may be offered for a single peril (e.g. river flood or hail damage) with an individual insurance policy or it may be grouped into a single block within one policy (CCS, 2008). There is also variation in what damage is covered, with policies potentially covering personal loss, direct material damages and/or consequential indirect losses. The specific clauses in terms of indemnity limits and deductibles are also variable.

Key Characteristics: Denmark	
Insurance scheme:	State-guaranteed insurance scheme for cyclone-induced sea flooding administered by private insurers.
Types of perils and flooding covered by insurance:	▪ Sea flooding, River flooding from private insurers. Rainfall flooding is excluded.
Optional/compulsory cover:	▪ Compulsory for sea-flooding and Optional for river flooding.
Insurance premium mechanism:	For sea flooding premium is via surcharge on all fire policies at a flat-rate.
Risk transfer mechanism:	Subsidised via the bundling system across risks – compulsory so spread widely.
Penetration/ coverage of flood insurance:	High for sea flooding due to the state-guaranteed system.
Presence of state aid or compensation:	Not clear regarding compensation funds
Summary:	Recovery from sea flooding is basically from the state-backed insurance – but only for this specific type of flooding.
Key principles of the recovery system	
Efficiency:	Caveat that buildings are not included if built in areas known to be at risk and if flooded before there is the need to take preventative measures.
Equity principle:	For cyclone-induced sea flooding – *Solidaristic risk-insensitive*.
Robustness of recovery system:	Medium – not risk-based so unclear how economically viable this is in the long term if premiums and levies prove to be insufficient.

A1.5 France

The French system of flood insurance is based upon the principle of national solidarity and that also all citizens should be treated equally in the face of national disasters. The current system was introduced by legislation passed on 13th July 1982 which made it a legal requirement for insurance companies to insure damages resulting from natural perils (Cannarsa et al., 2006). The CATNAT system (*Catastrophes Naturelles*) is in effect a State-backed insurance scheme whereby insurance is provided by private insurance companies but reinsured and therefore guaranteed by the state *Caisse Centrale de Réassurance* (CCR).

Insurance is mandatory under the terms of the 1982 Act and cover is provided within fire policies as well as that for other property damage (e.g. vehicles) (CCS, 2008) and so almost all households have insurance. This has created a situation whereby nearly all households are covered against flooding. High penetration is also seen amongst private renters, a group where coverage is typically lower. This is due to the requirement of landlords to verify that renters have purchased insurance as a condition of their tenancy (Michel-Kerjan, 2001). Indemnity mirrors that of the underlying policy for instance if coverage was only purchased for direct material damage to building and contents then this is what is covered against natural catastrophes. However, if business disruption is also purchased then this too will be covered against natural perils. The CCR, since 1993, is a limited company and is 100% owned by the State of France. Insurers do not have to reinsure with the CCR, they are able to purchase cover on the international reinsurance market: however, they largely choose to reinsure with the CCR (Gaschen et al., 1998), the attractiveness being the State backing for deficit years. The State CCR provides an unlimited guarantee (Porrini and Schwarze, 2014).

Machetti (2009) reports that reinsurance may take one of two forms. Firstly, a purely proportional quota-share solution which currently operates at a standard 50% for natural disasters and for which there is no reinsurance commission. Secondly, there is a non-proportional 'stop-loss' reinsurance. For excesses in this solution the guarantee is unlimited after the deductible is applied. Additionally, Machetti (2009) argues that the CCR is able to retrocede cover onto the international reinsurance market (and it has done so in the past) but often chooses not to.

One of the main aspects of the CATNAT insurance scheme is that the natural peril needs to be considered to be of 'abnormal intensity' (CCS, 2008) and therefore privately uninsurable. There is no clear list however of those perils that are included (although there was a further Act of 1990 which excluded storms and hurricanes from guarantee) and the key elements appear to be the scale of the event, the duration and the damages experienced. This lack of clarity and the absence of a clear definition of an event cause a lack of transparency and a lack of security amongst policyholders about whether they are insured and is a major criticism of the system (Gaschen et al., 1998; Michel-Kerjan, 2001).

A disaster needs to be declared by a decree for the cover to be invoked. An interministerial Commission (Arrêté Interministériel) has this authority and are able to designate the affected areas, the types of damages for which the guarantee will apply and, as discussed above due to the lack of clarity in the Act, even the events to which the system can apply (CCS, 2008). Additionally, the damage incurred needs to have directly (and only) resulted from the declared natural event. This clause may cause issues when flooding is experienced when mixed with other natural events, for instance storms, as these damages are now excluded from cover. The definition and declaration of an event are therefore critical to the recompense victims receive.

In order to be covered against these perils an additional premium is charged: at a flat rate. No differentiation is afforded regionally or by hazard type – therefore premiums are not risk-reflective in terms of the exposure. The additional premiums are varied according to type of asset covered and in 2008 were 12% for property damage, 12% for business disruption and 6% for damage to motor vehicles (CCS, 2008). The percentages are added to the price of the base policy, rather than on the amount insured (Machetti, 2009). Private insurers are required to settle any relevant claims under the terms and conditions provided in the base contract – i.e. if households have taken out a new-for-old policy they the guarantee provides this or replacement cost if their policy stipulates this. Deductibles are part of the system; both applied per contract and per event and are set by the State (CCS, 2008). These also vary according to the particular insurer but are considered to be low (Porrini and Schwarze, 2014). They are in the order of €380 for domestic motor vehicles, 10% of direct damages (minimum of €1140; c. NZ$ 1,838) for commercial properties or those owned by local communities and 3 days worked (minimum of €1140) for business interruption.

In general, the State-declared flat-rate premium does not distinguish between levels of risk and therefore provides little incentive for mitigation measures (Gaschen et al., 1998). However, there are other characteristics of the system which provide more encouragement. CCS (2008) report that the deductible was increased in 2001 in those locations where losses accrue in areas with a Foreseeable Natural Risk Prevention Plan (PPR) which aims to prevent indemnities being paid for repeated events. Deductibles are doubled in those Municipalities where disasters were decreed three times in five years, trebled when four times and quadrupled if more than five times. It is unclear whether these stipulations are having an impact on either local government or individual commitments to reducing flood losses (CCS, 2008).

Mitigation may also be encouraged through the unavailability of cover. Insurers are able to refuse to provide cover for natural catastrophes if properties are located in areas where construction is prohibited following the publication of a PPR or properties have been constructed below standards aimed to prevent damages from natural perils.

In addition to the CATNAT scheme, flood insurance can also be included in France within an all-risk policy or as a separate policy (Gaschen et al., 1998). This would cover flooding in less 'abnormal' situations as it would not require a decree for claims to be paid.

The public-private partnership and the spread of the risks through both the private market and public system are both considered to be the key advantages of the CATNAT scheme (Michel-Kerjan, 2001). He also goes on to suggest some limitations including that there is insufficient knowledge of the risks to permit risk-related premiums to be charged if this was desirable. This lack of comprehensive risk analysis is also hampering efforts to understand the needs for risk transfer and financing. It has also been criticised on the grounds that the current system does not do enough to promote and incentivise mitigation (Michel-Kerjan, 2001).

Key Characteristics: France	
Insurance scheme:	Privately-run, but largely State-guaranteed through reinsurance.
Types of perils and flooding covered by insurance:	Not clearly defined – no storm damage covered.
Optional/compulsory cover:	Compulsory.
Insurance premium mechanism:	Additional premium at a flat-rate – as a percentage of the base fire policy Flood-risk insensitive.
Risk transfer mechanism:	Some across risks – but largely State-Guaranteed.
Penetration/ coverage of flood insurance:	Very high – up to 100%.
Presence of state aid or compensation:	No separate compensation fund.
Summary:	Compulsory insurance backed by state guarantee.
Key principles of the recovery system	
Efficiency:	Aims to avoid claims from repeatedly flooded properties by deducible increased – which may influence mitigation – but this is currently a poor element of the scheme.
Equity principle:	*National solidaristic* approach – affords a minimal protection to everyone.
Robustness of recovery system:	*Medium* – the system appears to work well although the unlimited guarantee by the CCR makes it potentially vulnerable.

A1.6 Germany

Germany is a Federal state with a number of regional governments known as Bundesländer. Some flood risk management responsibilities are held at the central Federal level, whereas other including flood insurance availability and terms and conditions have varied between different regions. However, Magnus (2006; 121) argues that there is "no single instrument dealing exclusively with the compensation of damages through catastrophes". Importantly, Federal law prohibits compensation from flood damages either centrally or regionally provided; however assistance is provided in events termed to be catastrophic (Fiselier and Oosterberg, 2004). For example, following the 2002 flood event the Flood Victims Assistance Act (*Flutopferhilfesolidaritätsgesetz*) was passed to provide financial aid amounting to approximately €10 billion (c. NZ$ 16.1 billion) provided from both Federal and EU funding sources (Germany received €444 million (c. NZ$ 716 million) from the EU solidarity Fund following the 2002 floods). Government funds were considered to cover over 60% of all losses in the 2002 floods (Mechler and Weichselgartner, 2003). Residential claimants to the fund received a high amount of compensation and up to 80% of their property damages (at the full cost of repair or reconstruction); although a deductible was applied (Mechler and Weichselgartner, 2003). This high value of recompense is quite unusual for compensation schemes and Magnus (2006) argues that was to protect the economic situation in the East of Germany and not to affect the reconstruction process in that region. It remains to be seen whether a similar Act in the future will have such generous terms of compensation.

Although the Act mentioned above was only passed to provide assistance solely from the 2002 event Magnus (2006) argues that it should be taken as a precedent to how the German state may react following other disastrous floods; where the losses are significant enough the solidarity of the public at large is required. The Fund is financed both at the Federal and State levels, through general taxation and therefore in essence all contribute. He also goes on to suggest that there are stipulations in the Act which allow discretion about how the funds are allocated permitting the circumstances of those affected to be taken into account when assigning disaster funds. For instance, a loss (such as a car) suffered by a household considered to be wealthy may not be treated in the same way as from a poorer household (Magnus, 2006). This is thereby adding an element to compensation related to the perceived vulnerability of different households.

Some areas of Germany have a long tradition of insurance cover. Insurance cover for fire and (latterly) natural perils (including flood) was compulsory in Baden-Württemberg and was part of standard household policies (Thieken et al., 2006). Additionally, premiums existed for the natural perils component and were charged at 0.08 per thousand of the fire insurance value (CCS, 2008). Cover was provided by non-for-profit insurance entities from which householders had to purchase insurance. Similar procedures existed for Hamburg. In the former East Germany (the GDR) the State insurer covered natural perils within a standard household policy. When Germany was reunified in 1990, the insurance was moved to the company Allianz which continued to offer natural perils insurance, but at an increased premium. In 1994 the insurance entities in Baden-Württemberg and Hamburg lost their ability to act as a monopoly due to the need to satisfy EU conditions and free-market regulations. The insurance system was required to open-up which led to the end of compulsory flood insurance in these areas.

Flood insurance has been available in Germany via the private insurance market on a purely voluntary basis since 1991. Although banks require fire insurance cover in order to secure a mortgage this does not include insurance cover for natural perils (Porrini and Schwarze, 2014). Insurance is available as part of the 'Extension of Natural Risk Insurance' formula (CCS, 2008) and flood is available as a supplement (and provided independently of) to household buildings or contents policies. Flood risks are managed and spread by insurers either by the obligation of bundling flooding with other perils (e.g. landslide, earthquake, avalanches etc) or by placing specific restrictions on the coverage (such as excluding very high risks or risk-reflective pricing) (Fiselier and Oosterberg, 2004).

Premiums for flood and heavy rain have been differentiated by risk zone (ZÜRS) since 2001 which enables some degree of risk estimation (Mechler and Weichselgartner, 2003). Four different risk zones are used based on flood probabilities (< 1 in 200 years; 50 to 200 years; 10 to 50 years and > 1 in 10 years) with the highest risk (i.e. more frequent than 10 years) being considered to be uninsurable and the lowest risk (i.e. less frequent than 200 years) being fully insurable (CCS, 2008). In addition, deductibles are also often differentiated by risk zone; with those at the highest risk paying a higher deductible than those at lower flood risk although the specific terms vary between insurance companies (Gaschen et al., 1998). The terms of the insurance are the same as the base household policy and therefore largely also include household-related items outside of the property (such as fences, paths, cables etc).

Market penetration for household insurance was considered to be low (in 1998 was considered to be 10% (Gaschen et al., 1998) and in 2005 was between 5 and 10% (Machetti, 2009)) with contents insurance penetration being slightly higher. The low coverage of insurance is creating issues with anti-selection as flood risk is not being transferred and spread widely enough between households. Penetration is generally considered to be higher in those regions where flood insurance was once compulsory (e.g. 30 to 40% in areas that were part of the former GDR and up to 90% in Baden-Württemberg (Thieken et al., 2006)).

It is difficult to ascertain the impact of compensation funds and public assistance on insurance penetration as although there is no obligation on the Federal or regional governments to provide compensation for flood damage, the presence of financial aid for victims in the large events may be dissuading the purchase of insurance (CCS, 2008). Indeed, Seifert et al. (2013) explored through willingness-to-pay surveys the impact of so-called 'Charity hazard' on flood insurance penetration. On average those who did not obtain government aid in the past were more willing to spend €2 (c. NZ$ 3.22) more per month on flood insurance than those who did not, however there was no statistically significant difference between those who received government aid and those who did not in respect to their intention to purchase flood insurance.

Recent experiences (in particular the 2002 floods) raised concerns about the low penetration of insurance and, proposals were developed to explore the implementation of a new system of insurance for natural hazards (e.g. Schwarze and Wagner, 2004). These included the principles of mandatory insurance (of course to increase penetration) and having the Federal Government as the guarantor of last resort for extreme events (CCS, 2008) and the introduction of a system of bundled flood insurance backed by a pool (Schwarze and Wagner, 2004).

In a small way, the voluntary insurance in Germany does go some way to encouraging mitigation measures as accessing insurance is conditional on adopting legally-demanded preventative measures or construction standards depending upon the risk zone (CCS, 2008). However, the low penetration rate of insurance means that this is unlikely to have any large impact in promoting mitigation. Indeed, Thieken et al. (2006) suggest that only 14% of insurers that they surveyed rewarded voluntary mitigation.

Key Characteristics: Germany		
Insurance scheme:	Insurance cover available from private insurers.	
Types of perils and flooding covered by insurance:	Flood, torrential rain.	
Optional/compulsory cover:	Optional insurance cover.	
Insurance premium mechanism:	Actuarially-based premiums are differentiated according to risk zones.	
Risk transfer mechanism:	Some premium input but low penetration means high chance of anti-selection.	
Penetration/ coverage of flood insurance:	Variable depending on region but generally low (c. 10%).	
Presence of state aid or compensation:	Ad hoc Government compensation from extreme flood events.	
Summary:	Main mechanism of recovery is through government assistance – potentially deterring growth of insurance products.	
Key principles of the recovery system		
Efficiency:	Large focus on flood protection in Germany and the voluntary insurance does depend upon the adoption of preventative measures or standards – but low penetration means this is largely ineffective.	
Equity principle:	Insurance is based on the *individualist*, *risk-sensitive* principle.	Most compensation is via the government adopting the *National solidaristic* approach – but this is partly means tested which means all are not treated equally.
Robustness of recovery system:	*Low* – Although spreading risks across a very large group (all taxpayers) the ad hoc nature of compensation provision means it is difficult to plan for losses. Also no limit is specified.	

A1.7 Iceland

Insurance for flood damages are included alongside other natural perils within the *Iceland Catastrophe Insurance (ICI)* system. Windstorm damages are not included within this system and are instead covered by the private insurance system. The ICI is a public corporation which was created in 1975 and operates as an insurance company today regulated by the *Icelandic Catastrophe Insurance* Act 1992 (Act No 55) and the *Regulations on the Icelandic Catastrophe Insurance* Act 1993 (Act No. 93). All property owners – both commercial and domestic - are required to take out insurance cover for natural perils which also covers contents against fire damages. Insurance for natural perils is covered in a separate policy which is purchased by customers alongside the compulsory fire insurance policy. Private insurers administer this process for which they are paid a collection fee and they also collect premiums and claims which are subsequently forwarded to the ICI.

Penetration is close to 100% as the insurance cover is collected with fire insurance which is compulsory in Iceland (CCS, 2008). Only direct damages are covered (indirect damages being excluded) but are both for contents and building damages and are valued according to their real value at the time of loss and accounts for property depreciation (i.e. not new for old). Additionally, if underinsurance occurs, losses are provided proportionally. CCS (2008; 80) discusses the principles of the premiums and deductibles included within the system:

- A 0.25 per thousand premium for buildings and contents (collected by fire insurance companies)
- A 0.20 per thousand premium for infrastructures (collected directly by the ICI)
- A deductible of 5% of each loss (minimum deductible)
- Universal premiums which are set by law.

There is a set liability within the system of 10% of the total insured capital for each event. This means that if claims exceed this amount then all claims are reduced in proportion, so as to not exceed the total of 10%. The main concern to the ICI are losses from earthquakes, rather than floods, and in order to protect themselves the ICI also purchase reinsurance for this scheme on the global market.

The Icelandic system does include some provision for the better management of flood risks as "indemnification does not extend to damage to structures built in breach of the rules in place for reducing risk, thereby aggravating their vulnerability to the natural perils covered" (CCS, 2008; 80). There is also an inclusion to suggest incentives towards the adoption of preventative measures as Article 15 of the 1992 Act states that "an indemnification may be reduced or refused if a building suffers damage more than once from a similar event". But it is unclear to what extent this clause is ever invoked, leading to a refusal of cover or claims not to be paid.

Key Characteristics: Iceland	
Insurance scheme:	Privately administered insurance.
Types of perils and flooding covered by insurance:	Unknown.
Optional/compulsory cover:	Insurance cover is compulsory.
Insurance premium mechanism:	Premium is a flat-rate calculated as a percentage of the value insured.
Risk transfer mechanism:	Transferred to government and reinsured on the international market.
Penetration/ coverage of flood insurance:	Very high (c. 100%).
Presence of state aid or compensation:	No state compensation.
Summary:	State-backed compulsory insurance scheme.
Key principles of the recovery system	
Efficiency:	No losses covered if building standards are not met –but these are mostly in relation to earthquakes rather than flooding.
Equity principle:	*Solidaristic risk-insensitive* insurance.
Robustness of recovery system:	*Medium* to *High* – High penetration of cover and guaranteed by the state but is limited and losses are adjusted accordingly. Also aims to manage losses for repeated events. But needs to ensure that premium contributions are high enough – at the moment they are not risk differentiated.

A1.8 Italy

Flood insurance in Italy is offered purely by the private market although not all insurers offer coverage. For those insurers who do, flood insurance (as well as earthquake insurance) is offered as an endorsement for an additional premium. Both premiums and deductibles are differentiated according to risk (Gaschen et al., 1998) and only cover direct material damages. Additionally, Fiselier and Oosterberg (2004) report that there are often exclusions placed upon contents located on the ground floor up to a certain height (e.g. 20 or 30cm). These exclusions may act as an incentive to take action prior to flooding and raise or evacuate belongings; the extent to which this is undertaken is however uncertain. Gaschen et al. (1998) also suggest that there are quite strict limits on indemnification with a maximum of 50% of the sum insured for fire being covered. Penetration of insurance for domestic households however, is very low being reported in 1998 at only 5% (Gaschen et al., 1998) and less than 10% in 2003 (Paklina, 2003). More

recent penetration rates indicate that there is a high variation with roughly a north/south divide and also a rural urban split; although penetration rates are still generally very low. The South of Italy has the lowest penetration averaging less than 0.5% whereas the North is considerably higher (ANIA, 2011). Urban agglomerations in the North have the highest insurance penetration rate of c. 7% but overall the Northern regions average between 1 to 5% (ANIA, 2011). ANIA (2011) report some major improvements in the area of flood risk assessment and that in total 48% of all Italian communities have a degree of flood risk. This increased awareness of the scale of flood risk may consequently lead to a greater awareness of the need to take out insurance. However, low uptake of insurance is mainly connected to the fact that there is state compensation for the damages of natural events.

In Italy there is a strong expectation that the government will intervene in the case of natural disasters with the Italian government reportedly contributing €35 billion (c. NZ$ 56 billion) in the decade preceding 2006 (Monti and Chiaves, 2006).

State-funded aid following natural disasters is provided mainly through enacting emergency legislation on a case-by-case basis and is provided in an ex-post manner (Monti and Chiaves, 2006). They go on to describe the routine procedure when the State provides assistance following natural catastrophes. This involves the Regional government proposing that a declaration of a state of emergency be made which requires approval by the National government, the approval of which then paves the way for further government intervention.

There have been calls to reduce the reliance on government aid and proposals for a compulsory scheme for disaster insurance. Indeed, many different Reform Bills (notably in 1993, 1999, 2001 and 2003) proposing the adoption of various schemes were introduced and debated within the Italian Parliament (Monti and Chiaves, 2006). Despite some positive moves none of the Bills were passed and agreed. The most recent attempt began in 2012 and involved the creation of a system of mandatory cover and the pooling of risks from climate change (T. Thaler, pers. Comm.); however to date this scheme as not been passed and agreed by the Italian Government.

Key Characteristics: Italy	
Insurance scheme:	Private insurance which is available as an endorsement to household policies.
Types of perils and flooding covered by insurance:	Unknown.
Optional/compulsory cover:	Where insurance is available it is optional.
Insurance premium mechanism:	Risk-related – therefore flood-risk sensitive flood insurance.
Risk transfer mechanism:	Likely to be anti-selection as very small pool and not bundled.
Penetration/ coverage of flood insurance:	Low penetration of insurance cover – due to the presence of state financial assistance.
Presence of state aid or compensation:	State financial assistance provided on a case-by-case ad hoc basis.
Summary:	Flood recovery provided mainly through Government assistance.
Key principles of the recovery system	
Efficiency:	Currently there are few incentives to undertaken mitigation actions.
Equity principle:	Primarily a *national solidarity* principle due to the state involvement.
Robustness of recovery system:	*Low* – Emergency ad hoc compensation does not allow for the advanced planning of losses, nor the build up of a reserve. Also there are few limitations on the total amounts.

A1.9 The Netherlands

Flooding is a considerable natural hazard the Netherlands with a loss potential from coastal flooding (the most significant hazard) estimated at €300 billion (CCS, 2008). However, flooding from other sources including extreme rainfall also have the potential to cause losses with localised flooding in September and October 1998 leading to economic damages of €400 million (c. NZ$ 645 million) (CCS, 2008).

Flooding (from both river and the sea) has been excluded from all household insurance policies since the 1950s. CCS (2008) suggests that flooding (and earthquake) has been excluded on the basis that it would be technically difficult to assess the risk and the high potential losses that could be experienced. There is also the situation that in The Netherlands there is a large emphasis on flood protection; with high protection standards (of 1 in 10 000 years) which leads to the perceived sense of security and a lack of interest in flood insurance cover. This decreases the pool of potential customers and leads to concerns over anti-selection.

However, since 2000, losses due to flooding caused by extreme rainfall are covered by household policies (Faure and Hartlief, 2006). This includes both precipitation considered to be both 'direct' with water causing damage as a result of heavy rainfall or 'indirect' surface water flooding. Storm damage cover (including consequential losses such as rainwater damage) is included by virtually all insurers for an additional premium of approximately €0.15 per thousand of the insured value and a deductible of c. €2 per thousand (CCS, 2008).

There has been a relaxation to the binding agreement between insurers not to provide cover for riverine floods, in line with complying to EU competition regulations (see Section A1), and so flood insurance can now be provided by Dutch insurers. There have been some proposals suggesting mandating flood insurance cover (thereby reducing the chances of adverse selection) and other potential solutions to introduce more comprehensive flood insurance (Botzen and van den Bergh, 2008). On the whole, however, these have been unsuccessful in creating widespread cover. This has led to one insurer offering a new catastrophe insurance product from 2012 which includes insurance cover for flooding[2]. In this case for flooding insurance is bundled into a composite package with other risks including the risks of earthquakes, a terrorism incident affecting a property and damages caused by the explosion of World War II bombs. Insurance is purchased at an additional premium cost and provides cover of €75,000 (c. NZ$ 120,900) per property. However, insurance penetration for this cover is currently very low. Seifert et al. (2013) argues that this product alone will be insufficient to produce widespread cover for flooding for a number of reasons; the coverage it provides is limited, due to a shortage of insurance cover is only available for a limited number of households and the premium is currently too high to attract customers.

The government does have a system in place to provide financial assistance following uninsurable natural events; which Faure and Hartlief (2006) argues is based upon the Belgian catastrophe fund. The Calamities Compensation Act (*Wet Tegemoetkoming Schade bij Rampen en Zware Ongevallen,* WTS) (Faure and Hartlief, 2006) was passed in 1998 and provides assistance following flooding or earthquake loss and generally for uninsurable risks. This is considered to be an 'ex-post' compensation scheme for which no funds are collected before the event in a routine way (Seifert et al., 2013). The fund has an annual upper limit of €450 million (c. NZ$ 725 million); however it appears to exclude damages from seawater and thereby the greatest loss potential in the Netherlands. It is thought that the scope of compensation could be broadened by Royal degree if required (Faure and Hartlief, 2006).

Faure and Hartlief (2006) present a number of criticisms of the Dutch system; one of the key ones is that it fails from an equality perspective as the government only intervenes on an ad hoc basis and therefore not all victims of natural disasters may be treated the same. Additionally, there is uncertainty about the level of compensation that victims will receive and the compensation scheme lacks incentives for households to undertake mitigation and prepare for flooding (Seifert et al., 2013). Ultimately, the decision about whether to compensate and the scale of the compensation depends upon political will (Botzen and van den Bergh, 2008).

[2] http://www.eigenhuis.nl/webwinkel/verzekeringen/catastrofeverzekering/

Furthermore, the willingness-to-pay surveys conducted by Seifert et al. (2013) indicated that in The Netherlands the existence of a government compensation scheme was hampering the development of a private insurance market. Despite this, the results did suggest that many homeowners in The Netherlands did have a positive willingness-to-pay result for purchasing flood insurance; suggesting that there is a market for private flood cover in The Netherlands (Seifert et al., 2013).

Key Characteristics: The Netherlands	
Insurance scheme:	▪ Private insurance is available for heavy rainfall and surface water flooding – included within standard household policies; whereas other floods are excluded from cover. ▪ There is one insurance company providing an optional product for river flooding.
Types of perils and flooding covered by insurance:	▪ Heavy rainfall has been covered since 2000 including flooding for surface water. ▪ River and sea flooding is generally excluded. ▪ New single product for river flooding.
Optional/compulsory cover:	▪ Cover for rainfall is compulsory for properties which have a mortgage. ▪ Optional for new river flooding product.
Insurance premium mechanism:	▪ Standard policies – bundled with other risks. ▪ New river flooding bundled with other perils – but some risk-related element and high premiums reported.
Risk transfer mechanism:	Where available bundled with other perils and therefore transferred across perils.
Penetration/ coverage of flood insurance:	▪ High penetration for other standard policies. ▪ Low penetration for other optional products.
Presence of state aid or compensation:	Compensation is available from the State by currently excludes sea flooding – but arguably intervention still operates partly on an ad hoc basis.
Summary:	For the most serious flooding hazards – there is no flood insurance and a general reliance upon high flood protection standards to try to prevent losses. Financial assistance is available from the state via the Calamities Compensation Act 1998.
Key principles of the recovery system	
Efficiency:	Few ties and incentives for individual mitigation.
Equity principle:	*National solidarity* through State compensation – but the main principle is also national solidaristic via spending on flood defences.
Robustness of recovery system:	*Medium* - losses are spread widely via taxes, but the ex post nature of the compensation means that there is little ability to plan and build up reserves. But high defence standards limit the risks in many areas.

A1.10 Norway

Storms and floods are considered to be the largest natural risks in Norway (CCS, 2008). Similar to a number of other countries natural perils insurance cover is provided and administered by private insurance companies as a mandatory clause within all fire insurance policies This provision is set out in law via the 1979 Act on *Natural Damage*, the Act on *Insurance Contracts* and the special Act on *Natural Perils Insurance* in 1989. These stipulate that all property which is insured by fire is also covered for natural perils if that property is not covered by specific insurance for these hazards. Cover for natural perils is provided via the *Norsk Naturskadepool* a national pool run by a council to which all private insurers providing fire insurance cover belong. Sea floods are included within this policy, but rainfall is one of the exclusions suggesting that surface water damages would not be covered.

The pool provides for losses due to the direct damage of both buildings and contents, as well as certain aspects of the clean-up costs such as demolition, removal of materials, salvage costs and temporary storage of properties (Norsk Naturskadepool, 2008). There are also many exclusions within this policy, most significantly any property in transit, motor vehicles, ships and aircrafts and if there is poor maintenance of properties which may have exacerbated damages. Indemnification covers the repair, replacement or reconstruction of the property or contents.

The system is funded by an additional premium which is applied to all properties at the universal rate of 0.11 per thousand of the sum insured and is therefore not risk based (Machetti, 2009). Importantly, the pool is a losses (or distribution) pool, rather than a premium pool and premiums are retained by these private insurance companies who are members of the pool. The pool only acts to equalise losses (CEA, 2005). When an event occurs, a deductible of NOK 8,000 (c. NZ$ 1,696) is applied and charged to a policyholder and companies then pay the remaining claim and cede any losses into the pool. The total Pool loss from the event is shared amongst the members of the pool according to their market share; thereby spreading the loss amongst all insurers. If the premium accrued by a company is greater than that company's share of the compensation payments made through the pool and the claims reserve for unsettled claims, then the remaining is allocated to a special disaster fund within the company for use in the future. Therefore, the system benefits greatly from this ability to build up a reserve.

The Pool has a total event limit of NOK 12.5 billion (c. NZ$ 2.65 billion). If this amount is exceeded then the indemnification is reduced proportionally between the overall amount and the total damage caused. There is also an 'excess of loss' reinsurance programme (CCS, 2008) which offers coverage for NOK12.5 billion and which each company can be a reinsurer for a part of the programme equitable to their share of the pool (Norsk Naturskadepool website, 2013).

Key Characteristics: Norway	
Insurance scheme:	Private insurance as part of all fire policies – backed by a losses pool system.
Types of perils and flooding covered by insurance:	Unknown.
Optional/compulsory cover:	Compulsory cover for natural perils within the standard household policy – but it is unclear whether household insurance itself is compulsory – likely to be when tied to mortgages.
Insurance premium mechanism:	Bundled with other perils with a flat-rate additional premium – calculated per thousand insured.
Risk transfer mechanism:	Bundled and therefore subsidised across risks.
Penetration/ coverage of flood insurance:	Unknown – but due to the compulsory nature of natural perils insurance in all household policies it is likely to be medium to high.
Presence of state aid or compensation:	Compensation is not provided for insurable losses.
Summary:	Compulsory private insurance backed by a loss pool.
Key principles of the recovery system	
Efficiency:	Claims can be refused (or reduced) where damage is due to poor construction or maintenance or where an individual fails to prevent damage. However, there are no other specific requirements on mitigation. Additionally, properties subsequently constructed in known risk areas will not be covered.
Equity principle:	*Solidaristic* and *risk-insensitive* – all premiums have cover.
Robustness of recovery system:	*Medium* to *High* – insurance is backed by a reinsurance pool which is spread across all national risks and there is the ability to increase premiums.

A1.11 Poland

The primary recovery mechanisms available in Poland is through insurance policies; however since 1989 flood insurance has become voluntary and Fiselier and Oosterberg (2004) suggest this has had a negative impact on penetration. There is only an obligation to take out insurance in the agriculture sector (Porrini and Schwarze, 2014). Recent events such as those in 1997 and 2002 have highlighted that little assistance was available from the central government and many had to rely on charitable donations for any kind of financial assistance. The Polish government is able to apply for financial assistance from the EU Solidarity Fund the extent to which any of these funds would be distributed to assist recovery from private households is unclear. Porrini and Schwarze (2014) indicate that for floods insurance density is between 25 and 50% indicating that there are many people who have no means of flood recovery.

The CEA (2005) report that compulsory insurance exists for agriculture against natural hazards and that compulsory flood insurance for the rest of the market was being considered.

Following both the 1997 and 2010 floods the government did provide some compensation to those affected. However, this approach appears to be enacted on an ad hoc basis and there are few formal rules governing this intervention. It is unclear whether the government would again intervene in this way and provide compensation following future floods. The intervention in 1997 and 2010 was prompted by the large scale of the floods and the high loss to public property. It is not clear whether individual householders were directly compensated or whether most of the monies were directed at primarily reinstating public infrastructure.

Key Characteristics: Poland	
Insurance scheme:	Exclusively a private insurance market.
Types of perils and flooding covered by insurance:	Unclear.
Optional/compulsory cover:	Optional.
Insurance premium mechanism:	Unclear how much this is tied to risk.
Risk transfer mechanism:	Low penetration means that there is a high risk of anti-selection.
Penetration/ coverage of flood insurance:	Low to medium penetration c. 25 to 50%.
Presence of state aid or compensation:	Some government compensation may be provided on an ad hoc basis following large flood events
Summary:	For those with no flood insurance there is the need to rely on charitable aid and they are unlikely to receive sufficient compensation to repair properties.
Key principles of the recovery system	
Efficiency:	No tie to mitigation measures mentioned.
Equity principle:	*Individualistic.*
Robustness of recovery system:	*Low* – low penetration means that there is a high chance of anti-selection. The State is not overly exposed in terms of requirements to compensate – but the lack of a viable system of recovery for individuals will have negative economic effects.

A1.12 Portugal

Portugal has a high potential for both fluvial and flash flooding, particularly in urban areas. Cover for flooding is provided by private insurance companies and is included primarily with other perils as part of fire policies. Gaschen et al. (1998) reports that penetration is high despite insurance not being compulsory or automatic. This is thought to be due to the traditional grouping of flood insurance with earthquake insurance – the peril which is considered by many (including the public) to be the key natural risk and therefore encourages people to seek insurance. Premium rates are to cover flood, storm and landslide perils range between 0.1 to 0.25 per thousand and a deductible is set at around 10% of the loss incurred (CEA, 2005).

Key Characteristics: Portugal	
Insurance scheme:	Private insurance as part of fire policies.
Types of perils and flooding covered by insurance:	Unclear.
Optional/compulsory cover:	Optional.
Insurance premium mechanism:	Bundled with earthquake for an additional premium – calculated as a percentage of the sum insured
Risk transfer mechanism:	Subsidised via bundled policies and therefore transferred across risks
Penetration/ coverage of flood insurance:	High penetration.
Presence of state aid or compensation:	Unknown.
Summary:	Flood recovery appears to be mainly via private insurance.
Key principles of the recovery system	
Efficiency:	Unknown.
Equity principle:	*Solidaristic risk-insensitive.*
Robustness of recovery system:	*Medium* - the high penetration means that the system is relatively robust – but only if premiums are sufficient in comparison to disaster losses.

A1.13 Romania

The PRAC (*Programul Roman de Asigurare la Catastrofe*) scheme provides coverage for flood (as well as landslide and earthquake) and is hailed as a simple and inexpensive scheme (CCS, 2008). It is administered by private insurers who collect premiums, issue policies (named PAD), assess losses and pay claims. The scheme is compulsory and applies only to the property component of private households whereby cover is provided on a replacement basis; no cover is provided for contents. CCS (2008) describe the two types of properties based on their building materials; those with reinforced concrete frames, metal or with walls of burnt brick or wood and those with walls made of burnt brick. The limits of scheme vary according to the class of the building with the former having a limit of approximately €20,000 (c. NZ$ 32,240) and the latter €10,000 (c. NZ$ 16,120); although these are annually variable.

The scheme is compulsory and compliance is checked by comparing all dwellings in an area with a list of policies taken out. Those who do not take out cover are reminded and subsequently may be fined. The central government provides the premiums for those who receive social welfare and are unable to afford the cover and will thereby act as the insurer in these cases.

A company entitled PAID runs the scheme which comprises a group of insurers. The scheme is underwritten by a pool formed on the basis of a joint stock company whose shareholders are the insurers. Each of the insurers is required to contribute to the fund and dividends will be paid out if the fund accrues any profits. A National Disaster Fund has been established by PAID to finance claims; although the scheme itself is reinsured on the international market. Additionally, the government commits to covering the shortfall if the PAID fund runs short of money following major disasters. However, this scheme

will replace any other governmental assistance and none will be paid out to private households. CCS (2008) describes the PRAC scheme as being an interesting international example due to the centrality of the insurance industry to the scheme and the lack of intervention of the government in the running and governing of the approach. They also suggest that some insurers will use the access to customers as an opportunity to up-sell insurance cover for other perils such as fire. There are some limits on the scheme as policies are provided on an annual aggregate basis (CCS, 2008). This means that there is some guarding against repeated claims as the total to which a dwelling is insured is reduced by the amount of any claims paid in the same year. This provides an incentive for homeowners to take out mitigation measures as they will recognise that they will not be compensated to the same degree. However, this is likely to only be effective for the very highest risk areas which will be subjected to very frequent floods.

Key Characteristics: Romania	
Insurance scheme:	Privately administrated insurance backed by an industry-run pool.
Types of perils and flooding covered by insurance:	Unknown.
Optional/compulsory cover:	Compulsory for buildings.
Insurance premium mechanism:	Unknown.
Risk transfer mechanism:	Bundled and therefore subsidised across risks.
Penetration/ coverage of flood insurance:	High penetration.
Presence of state aid or compensation:	Unknown if there is government compensation – but the government assists those on social welfare by providing insurance cover.
Summary:	Private insurance for natural hazards with a backing-pool; but with government intervention for those who cannot afford insurance.
Key principles of the recovery system	
Efficiency:	Level of indemnification is linked to building type. It is also an annually-limited scheme to avoid repeated losses and therefore may encourage mitigation for high risks.
Equity principle:	*Solidaristic* across those insured.
Robustness of recovery system:	*High* to *Medium* –Clearly planning for losses through the pool. The scheme has upper limits on the indemnification; thereby limiting losses. Also annually-limited reducing exposure to repeated loss.

A1.14 Spain

In Spain there is a legal obligation to insure property against damages from natural perils (Porrini and Schwarze, 2014). Natural hazards are insurable via the *Consorcio de Compensacion de seguros* (Insurance Compensation Consortium) and some types of flooding are included within this. The *Consorcio de Compensacion de seguros* originally acted as a monopoly until 1991, when private insurers were also able to offer natural perils insurance. Insurance is still provided by the Consortium however and cover for "extraordinary" risks (natural perils and other social risks including terrorism) are included as standard. The Consortium is a public corporation, however it has its own assets and its activities are subject to private law and it subject to the same restrictions and laws as other insurance companies (CCS, 2008). Cover for natural perils is compulsory and included automatically in all household buildings and contents policies as well as for life insurance and personal accident. Cover is administered by private insurance companies who collect the premiums for which there is an additional cost (Porrini and Schwarze, 2014).

The CCS assumes cover for the extraordinary risks on a subsidiary basis and will pay indemnifications when there is no cover expressly assumed within a policy issued by a private insurer or when a private insurer has assumed cover and it subsequently not

able to settle claims (e.g. through bankruptcy). It effectively acts as the reinsurance cover for natural perils insurance. It is funded via a surcharge on every insurance policy and a fixed percentage of every premium contracted by insurance companies is paid to the organisation (Auffret, 2003). Importantly, the surcharge must be paid on all household policies irrespective of whether a policy provided by a private insurer actually includes cover for natural perils. Therefore all of those insured contribute to funding natural disaster recovery spreading the risks geographically, temporally and across risks (CCS, 2008) and thereby avoids adverse selection. For household insurance the surcharge to be paid to the Consortium is 0.09 per thousand (CEA, 2005) which are collected as part of the normal premium and then ceded to the Consortium each month, minus a 5% collection and administration fee which the insurance company retains (CCS, 2008).

Those events covered need to be 'extraordinary' in nature and are legally defined based principally on the frequency and intensity of the peril; rather than the loss experienced (CCS, 2008). This has the benefit of equity of cover as "even if an event only affects a single insured, that insured, independently of the extent of the damage, will be entitled to compensation" (CCS, 2008; 141). As there is already clear guidelines about what is covered, those insured can be confident about the terms of their coverage and there is no need for a disaster to be declared. For the purposes of cover floods are considered to be "the inundation of the terrain caused by rainfall or melt water, by water from lakes with a natural outlet, from estuaries or rivers, or from natural watercourses on the surface whenever they overflow their normal channels" (CCS, 2008; 141). Additionally, flooding from the sea is also included. Damages caused by heavy rain falling directly on the property are excluded from the definition of flood as are any damages caused by dam break or the inadequacy of sewers or a property's drainage network. There are also exclusions based on the need for effective maintenance of properties or due to defects with the property's construction.

Generally, claims will be made directly to the insurer and a deductible is applicable if damages are covered by the Consortium which for property losses is in the order of 7% of the value of the insured damages (CCS, 2008). The Consortium is required to establish an equalisation reserve which is cumulative and exempt from taxes. This allows funds to be reserved and accumulated across years to be able to cover the more infrequent larger events. Auffret (2003) argues that the current system in Spain means that penetration of insurance is high and that securing insurance against flooding is relatively straightforward. Porrini and Schwarze (2014) suggest that penetration varies between sectors (e.g. buildings, contents, life etc.) however it reaches as high as 80%. It can also be considered to be a guaranteed system which protects the insurance industry from excessive losses (D. Perez, pers. comm.). Machetti (2009) highlights that one of the unique aspects of the Spanish system is that it does not use risk transfer tools towards third parties (i.e. there is no international reinsurance) all of the risk is held nationally.

Key Characteristics: Spain	
Insurance scheme:	State-backed insurance system.
Types of perils and flooding covered by insurance:	Unknown.
Optional/compulsory cover:	It is a compulsory element of all household policies.
Insurance premium mechanism:	An additional premium on all policies – but this is at a flat-rate calculated as a percentage of the sum insured.
Risk transfer mechanism:	Subsidised across all risks via a bundled policy.
Penetration/ coverage of flood insurance:	High penetration.
Presence of state aid or compensation:	No.
Summary:	Recovery is via the state- guaranteed system.
Key principles of the recovery system	
Efficiency:	Unknown for flood – but building codes are in use but not clear if these relate to flooding.
Equity principle:	*Solidaristic.*
Robustness of recovery system:	*High* – there is a high spreading of the risks via bundling and also high penetration. The pooling system permits planning for losses, collection of the levy on all policies and also a state-guarantee. But all of the losses are held nationally and if many natural events occur it may expose Spain to high losses.

A1.15 Sweden

Nyquist and Persson (2006) stress the need for Swedish citizens to rely upon private insurance to recover from damages from natural events. They argue that although voluntary, insurance is widespread and that most people have some kind of insurance to provide cover for property damages; including general household policies as well as additional insurance products. As in many countries insurance in Sweden is divided into buildings and contents insurance with over 95% of the population having coverage for their properties (Svensk Forsakring, 2013). Most policies are composite in nature and bundle many different perils together. Standard policies will generally have some coverage for flooding that has flowed in from the ground's surface through for example a doorway or window, or made its way up a sewer; water damage which penetrates through the walls as a result of faulty drainage is not insured. If flood insurance is provided for water damage which has been caused by heavy rains, snow melt or from water from a rising lake or watercourse (S. Goytia, pers. comm.).However, there may also be relevant exclusions. Nyquist and Persson (2006) provide an example of "damage due to flooding because of the failure to build a barrage" and thereby mitigation measures are encouraged.

A relatively high deductible is usually charged; 10% of the damages (but with a minimum of SEK10, 000 (NZ$ 1,882) (Konsumenternas website, 2012). Although in a formal sense there is no State compensation for the damages from flooding, financial compensation may be provided to property owners if the municipality is in some way responsible for the damages. An example of this may be if a municipal sewerage system was unable to cope with all of the rainwater (S. Goytia, pers. comm.) however the extent of the liability of a municipality for extreme events is unclear and in the first instance property owners should seek to claim from their insurance policies.

There is no generalised compensation system for recompense under Swedish Law and therefore victims of catastrophes will be required to apply to the Social services and insurance system to get assistance for their basic needs (Nyquist and Persson, 2006).

Key Characteristics: Sweden	
Insurance scheme:	Bundled insurance via the private market.
Types of perils and flooding covered by insurance:	Flooding directly to the property from rivers or other watercourses, heavy rainfall or snowmelt.
Optional/compulsory cover:	Household insurance is optional.
Insurance premium mechanism:	No additional premium for flooding – bundled policies.
Risk transfer mechanism:	Risk is transferred via spreading across all risks in the bundled system – spread further by reinsurance.
Penetration/ coverage of flood insurance:	Very high coverage – 95%
Presence of state aid or compensation:	None.
Summary:	Recovery from flooding is almost exclusively based on the purchase of insurance from the private insurance market.
Key principles of the recovery system	
Efficiency:	Unknown.
Equity principle:	*Solidaristic, risk-insensitive* insurance but was aiming to move towards higher premiums for those at greater risk and therefore *individualist, risk-sensitive* insurance.
Robustness of recovery system:	*Medium* – The system should be relatively robust depending upon the balance between premium income and claims.

A1.16 Switzerland

Flooding causes the most material damages of all of the natural perils suffered in Switzerland (CCS, 2008) and in the last 40 years has accounted for 71% of the natural perils claims (Hausmann et al., 2012). Similar to a number of other countries, household fire policies are the mechanism by which households are covered for flooding. All insurers offering fire cover are required to provide natural perils insurance under the Swiss Federal Council Order on the Supervision of Private Insurance companies (2005); with Article 173 mandating that flood and storm cover be included. However, there is a dual system of flood insurance provision in Switzerland: with insurance provided by single Canton insurers in 19 of the Cantons and private insurance available in the remaining eight GUSTAVO cantons (CCS, 2008). Additionally, buildings contents insurance is only available via private insurers across all of Switzerland (except for in Vaud and Nidwalden).

Cantonal Buildings Insurers (CBIs) provide the cover in the former of these situations; however the specific terms of the insurance varies between Cantons. However in general, premiums are fixed for all natural perils and are not risk-related. In the 19 Cantons where there is this type of insurance, property owners are legally obliged to take out natural perils insurance (including flooding) for their building structure (Hausmann et al., 2012) and therefore penetration is high (at almost 100%) (Gaschen et al., 1998). When claims occur, indemnities are provided at new value (provided that the real value of the asset is greater than 50% of the indemnified value) and there are some funds available for demolition and repair.

Deductibles are conditions of the policies of all of the Cantons but the terms and conditions of these vary considerably including; ranging between 10 and 15% of damages to properties (with a minimum of CHF 200 and a maximum of CHF 2,000 (between c. NZ$ 259 and NZ$ 2,592) (CCS, 2008). Canton building insurers take out loss excess reinsurance through the Intercantonal Reinsurance Union (IRV) (CCS, 2008). Due to the quasi-State nature of the IRV, reinsurance operates on a "'solidarity-based' distribution of risks, focussed on the Intercantonal Community for Risks from Natural Elements (IRG)" (CCS, 2008; 150) and provides cover of up to CHF 750 million (NZ$ 972 million). If the IRG needs to be invoked the canton insurers are then required to contribute to the fund to spread the risks depending upon the capital insured; therefore the approach is considered to be a system of reciprocal

contribution obligations (i.e. with no premium collection) (Machetti, 2009).

The second type of flood insurance cover for buildings is provided by the private market in the other eight GUSTAVO cantons; Geneva, Uri, Schwyz, Ticino, Appenzell Innerrhoden, Valais and Obwalden) (Hausmann et al., 2012). Household premiums for this insurance (as well as for contents) are at a flat rate (i.e. not risk related) and in 2008 were calculated as 0.21 per thousand of the insured amount for domestic contents and 0.46 per thousand for buildings (CCS, 2008). Deductibles for domestic contents are similar to the Canton buildings insurance at CHF 500 and 10% of damages for domestic buildings (with a minimum of CHF1000 and a maximum of CHF10, 000).

For natural hazards cover, private insurers retain 20% of losses with the remaining 80% being ceded to the *Schweizer Elementarschaden-Pool* (Swiss Natural Hazards Pool). This entity acts as a claim Pool whereby 80% of insured losses are recovered by insurers from this pool which is reinsured externally; the remaining 20% of losses are redistributed proportionally across all of the Pool members according to their market share. Some insurers may choose to reinsurer their remaining 20% on an individual basis (CCS, 2008).

In addition to insurance for flooding, there is also a Swiss Fund for Aid for Non-Insurable Damage caused by Natural Hazards which was created in 1903. This is a private institution which provides aid for damage for uninsurable and unforeseeable natural events. Monies are generated for the fund by donations, income generated by management of its assets and a percentage of the takings of gaming houses (CCS, 2008). It is not clear however, whether any financial assistance has been provided for flooding as in the most part this should be considered to be an insurable risk.

Key Characteristics: Switzerland[3]		
Insurance scheme:	Cantonal insurance.	Private insurance system in GUSTAVO.
Types of perils and flooding covered by insurance:	Varies by policy.	
Optional/compulsory cover:	Compulsory part of building cover.	
Insurance premium mechanism:	Generally are fixed and not risk related.	Additional premium at a flat-rate – based on a percentage of the sum insured
Risk transfer mechanism:	Bundled and subsidised across risks.	
Penetration/ coverage of flood insurance:	Generally high – almost 100%.	
Presence of state aid or compensation:	Privately-funded compensation fund but is not for insurable risks	
Summary:	A duel system of insurance backed by a pool system or reinsured via the IRV.	
Key principles of the recovery system		
Efficiency:	Unknown – there is the existence of building codes but these are likely to be related to earthquake risk.	
Equity principle:	*Solidaristic.*	
Robustness of recovery system:	*High* to *Medium* – a system with high penetration and a reserve pool to spread losses. Should be very resilient if premiums are high enough. These are not risk-reflective however.	

[3]The split in some of the cells the left hand column reflects the dual nature of the insurance system. Where there is a split the Cantonal Insurers is described first, before the private insurance in the GUSTAVO cantons.

A1.17 Turkey

Following the devastating earthquake in Marmara in 1999, the World Bank assisted the Turkish Government in establishing the Turkish Compulsory Insurance Pool (TCIP) (OECD, 2004). The insurance system was created to provide cover and compensation for material damages from earthquakes, as well as enabling the spreading of the financial burden within Turkey and onto the international reinsurance market and use insurance as a mechanism for incentivising the better construction of houses. Insurance policies are wholly administered by private insurers although the TCIP ultimately bears the risk. In 2001 earthquake insurance become compulsory for a range of buildings and dwellings on privately-owned land are included; but importantly dwellings in residential areas of villages are excluded from the compulsory cover. This is due to the difficulty in regulating building construction standards and the low incomes of these dwellers; they are however still able to participate and can optionally choose to purchase insurance cover

(CCS, 2008). Properties can be insured up to a total amount of NTL 110 000 (c. NZ$ 72,650) and premiums are altered and are partly-based upon the earthquake insurance risk, the size of the property and the type of construction. Premiums therefore range between 0.44 ‰ for strongly-constructed properties in the lowest risk zone to 5.5 ‰ for properties with weaker construction in high risk zones (CCS, 2008).

The TCIP is a first loss policy and losses are calculated based on the new construction value with a deductible of the 2% of the total insurance amount (CCS, 2008). Critiques of the approach claim that the approach has not yet solved moral hazard issues, that risk-related premiums are falling short of their necessary value and that deductibles are still too low (OECD, 2004). In 2004, insurance penetration had only reached around 26% despite the compulsory nature of the cover; too few dwellings are mandated to take out insurance (OECD, 2004). However, there is a condition that if a household is not registered with the insurance system there are restrictions on accessing water, electricity and gas services which is aiming to increase the numbers participating in the insurance system (F. Atun, pers. comm.).

The TCIP is an example of a framework for the insurance of natural perils. However, the associated Act makes no mention of flooding; however it does supposedly cover the indirect impacts of an earthquake. The Act mentions that this includes fire, explosion, tsunami and landslide and therefore it is possible that some indirect water-related damages stemming from an earthquake may also be covered.

Key Characteristics: Turkey	
Insurance scheme:	Government established Turkish Compulsory Insurance pool.
Types of perils and flooding covered by insurance:	Possible that some earthquake related flood risks are included.
Optional/compulsory cover:	n/a.
Insurance premium mechanism:	n/a.
Risk transfer mechanism:	n/a.
Penetration/ coverage of flood insurance:	n/a.
Presence of state aid or compensation:	Not for flooding.
Summary:	Generally flooding is not included – but there is now a framework for insurance and so it would be possible to extend it to include flood.
Key principles of the recovery system	
Efficiency:	n/a.
Equity principle:	n/a.
Robustness of recovery system:	n/a.

A1.18 United Kingdom

There is a long tradition of flood insurance in the United Kingdom. Flood insurance cover has been available as part of composite household policies since 1922 and total loss insurance was offered from 1929 (Arnell et al., 1984). Cover has always been provided by private insurers with arguably little government involvement. However, in the early days of flood insurance cover was optional and market penetration low (Arnell et al., 1984) suggested that it was as little as 10% in some events in the 1960s). Repeated flooding in the 1940s, 1950s and 1960s and the necessity of government to provide funds to assist the recovery of those affected, raised concerns that this assistance would become normalised, would be unaffordable and was deterring the purchase of flood insurance. In the early 1960s there was some suggestion in Government that reforms were needed and additional regulation was required. This led to what was known as the Gentleman's Agreement between the UK government and insurers, set out in a *Memorandum on flood cover to be provided by the private insurance market.* It was issued by the British Insurance Association and the Fire Officers Committee (the predecessors of the Association of British Insurers (ABI)) in which insurers provided the following reassurance to HM Government:

"Insurers...are prepared, on request, to provide Flood cover at reasonable rates for the contents of all private dwellings (including farm dwellings) which are permanently occupied. Such cover will normally be granted only in conjunction with cover against Fire, and the Insurers may find it necessary to require that Storm and Tempest cover is also effected. In the case of swellings vulnerable to flood the additional rate for Flood cover would not normally exceed 10/-d% and the insurance would be subject to a small excess."

Source: BIA/FOC (1961)

Additionally, over the next decade or more both insurers and the government tried to raise the profile of flood insurance (through national campaigns) and increase market penetration. This ultimately led in the 1970s to flood insurance becoming a compulsory peril for all properties which were secured with a mortgage.

Fundamentally, flood insurance in the UK has existed on the same principles ever since. Flood insurance is:

- Provided by the private insurance market
- Available as part of a composite household policy (e.g. with fire, theft, other natural perils)
- Available within these bundled policies on both contents and household insurance
- Insurance is available for direct damage to business and business disruption – mostly as part of composite policies.
- In general, the flood insurance component of the cover is cross-subsided across the other perils within a policy.

The Gentleman's Agreement between the UK government and the flood insurance industry enjoyed a long period of relative stability until following the 2000 floods. Following this, a series of evolving Statements of Principles were issued by the Association of British Insurers (ABI) in 2001, 2003, 2006 and 2009 which aimed to redefine the relationship between insurers and UK government and reemphasise the need for effective flood management (ABI, 2001; 2002; 2005; 2008). These agreements aimed to ensure the UK government committed and resourced certain key features of flood management and in return insurers would continue to provide flood insurance to the majority. The main management measures featured:

- Increased funding for flood defences. At least £145 million (c. NZ$ 273 million) more per year is needed to enable flood defences to be strengthened to meet minimum standards and new defences to be built to protect vulnerable areas.
- Tighter planning controls. The ABI supports Government efforts to reduce building on floodplains and to improve the protection of developments that do take place.
- The maintenance, planning and execution of flood defences in vulnerable areas needs to be improved. Existing arrangements are far too complex and lead to huge regional discrepancies and unnecessary delays.

The agreements also had conditions which aimed to limit the exposure (of insurers in particular in high-risk areas and those repeatedly affected) including:

- A statement about acceptable levels of risk and through which they divided requirements into:
  a. areas of 1 in 75 or less (cover available as a standard feature of household)
  b. areas of significant flood risk 1 in 75 or more and where improved defences are planned within 5 years (cover available as a standard feature of household) and
  c. areas of significant flood risk where no improved defences are planned (insurers cannot guarantee to continue cover).
- Exclusion of newly built property and a specific clause that the Statement of Principles does not apply to any new property built after 1 January 2009"
- The premiums charged and other terms - such as excesses - will reflect the risk of flooding but will be offered in a competitive market.

Despite these terms, there was an increasing recognition amongst insurers with business in the UK that premiums were too low and not reflecting the risk. Although general underwriting principles have been enshrined even from the initial 1960s Gentleman's Agreement as those who were at the highest risk were meant to pay a modest increase in premium. Subsequent agreements maintained this provision that those at the very highest risk should pay more.

Despite these caveats, and the reiteration in the Statements of Principles that risk-reflective pricing was necessary to make cover robust and efficient coupled with improvements in technology making the pricing of risk better and more cost-effective, in reality there was very little pricing difference between high and low risk properties (Lamond et al., 2009). Recent flood events have led to some increases in premiums in high risk areas (for those who have been flooded) leading to affordability issues and anecdotal evidence of unavailability. However, on the whole evidence suggests that the flood insurance component of policies is under-priced; this is primarily due to the high competitiveness of the UK insurance market (Defra, 2012). In 2010, the ABI reported that 78% of those at significant flood risk have lower premiums than they should if the price properly reflected the risk and on average these properties were under-priced by 165% or £430 (c. NZ$ 810) (ABI, 2010).

This - amongst alongside other drivers - including the need to comply with Solvency II, repeated large claims, concern about how climate change may affect their exposure and a better understanding of their exposure to surface water flooding – has led to the insurers ending the Statement of Principles in Summer 2013 and moves towards the introduction of a new system of insurance. Currently, insurance penetration is quite high. In 2010, 75% of properties had household contents insurance and 63% of properties has structural insurance (ABI, 2012).

Huber and Amodu (2006) argue that although there are no government compensation funds in the UK for insurable risks and therefore to provide financial assistance, private insurance depends upon the state in two ways: insurance provision relies upon a certain level of flood protection and that the state has to guarantee the independence of the compensation-regime. The balance between public and private intervention is changing with the recent announcement (June 2013) of a new system of insurance coverage in the UK and a greater involvement of Government.

Currently, there are few incentives (either as a requirement or financial) from an insurance perspective to mitigate against flood risk (Lamond et al., 2009) and there appears currently to be a weak link between flood risk reduction and premium reductions (Penning-Rowsell and Pardoe, 2012a).

Key Characteristics: United Kingdom – System prior to Summer 2015	
Insurance scheme:	Bundled insurance via the private market.
Types of perils and flooding covered by insurance:	All types of flooding are included within standard policies.
Optional/compulsory cover:	▪ Buildings insurance is compulsory with a mortgage loan. ▪ Contents cover is optional.
Insurance premium mechanism:	Premiums are cross-subsided by its composite nature. Also has reinsurance.
Risk transfer mechanism:	Risk is transferred via spreading across all risks in the bundled system.
Penetration/ coverage of flood insurance:	Quite high – estimates vary but for buildings it is in the range 60 to 65% and for contents 75%.
Presence of state aid or compensation:	None.
Summary:	Recovery from flooding is entirely based upon the purchase of insurance from the private insurance market.
Key principles of the recovery system	
Efficiency:	The insurance industry exerts pressure on the government to better manage flood risk. There is some pressure on high risk properties to try to minimise their risks for insurance to be available – however there is little evidence to suggest whether there would be a premium reduction if measures were implemented.
Equity principle:	*Solidaristic, risk-insensitive* insurance but was aiming to move towards higher premiums for those at greater risk and therefore *individualist, risk-sensitive* insurance.
Robustness of recovery system:	*Medium* – Large losses and inadequate premiums have called into question the economic viability of the insurance system – also a higher awareness by insurers of the loss potential.

New system of insurance in the United Kingdom – the system post-Summer 2015

A proposal for a new system of insurance within the United Kingdom was announced in late-June 2013. The proposal is currently undergoing a very short period of consultation (6 weeks) and requires new legal arrangements to be included within the draft Water Bill (UK Government, 2013). The proposal is based upon the establishment of 'Flood Re' which is a pool-backed system whereby premiums for properties at high-flood risk will be capped and subsidised by the pool (Defra, 2013a). There will be some differentiation of premium cap, but this appears to relate only to the size of the property (and is administered via council tax band).

The new approach will maintain insurability by spreading the higher risks across all household policies and geographically; rather than merely within individual insurers. Defra (2013a) provides a table which indicates some projected end prices for household insurance and indicates the level of subsidy that would be provided by the pool for the high-risk properties (Table A2). As part of the new approach premiums are set to rise and be more risk related. They are considered to be 20 to 25% higher than the current premiums being paid (Defra, 2013a); but Table A2indicates this is considerably less than might be the case. The Flood Re pool will essentially act as a reinsurance or claims pool from which insurers will be allowed to draw upon to settle claims (or a proportion of the claims) from properties at high flood risk for which they do not achieve an adequate premium. The premiums (and therefore any subsequent claims) are subsidised by a levy payable by insurers at an annual rate of around £180 million (c. NZ$ 340 million) for each of the first five years (Defra, 2013a) although this is set to be renegotiated after this initial five year period (ABI, 2013). This will be passed on to every household insurance customer through a cross-subsidy; which is roughly in the order of £10.50 (c. NZ$ 19.75) for each policy with buildings and contents insurance

(Defra, 2013a). Defra (2013a) suggest that this new system is only a formalisation of the current way in which all the composite insurance cross-subsidises higher risk and that the that the price of insurance should not be significantly increased for the majority.

Despite the pool being set up, owned and managed by the insurance industry as a not-for-profit entity, as the levy is payable on all insurance policies some of the funding may be classified as a tax and therefore the status of the pool is to date undecided. If there are some elements of tax (and therefore essentially public resources) these might need to have a higher degree of accounting and transparency and therefore the pool might need to be classified as part of the public, rather than the private sector (ABI, 2013); this will be resolved as part of the draft Water Bill (UK Government, 2013) and the consultation about the Flood Re proposal (Defra, 2013b).

Table A2: Projected end prices to high-risk policyholders for a combined buildings/contents policy

Table 2: Expected approximate end prices to high risk policyholders for a combined buildings and contents policy, including other perils, assuming overheads/profit add 66% to net prices

Council Tax Band	A	B	C	D	E	F	G	H
Technical flood component charged by Flood Re	£ 210	£ 210	£ 246	£ 276	£ 330	£ 408	£ 540	No cap/not eligible
Other perils (fire, theft, etc)	£ 180	£ 180	£ 186	£ 204	£ 222	£ 252	£ 390	""
Insurer overheads, profit	£ 260	£ 260	£ 288	£ 320	£ 368	£ 440	£ 620	""
End price to policyholder, gross, all perils	**£ 650**	**£ 650**	**£ 720**	**£ 800**	**£ 920**	**£ 1,100**	**£ 1,550**	""
Compared to fully risk-reflective prices, gross, all perils[26]	£ 1,140	£ 1,165	£ 1,185	£ 1,290	£ 1,430	£ 1,560	£ 1,850	""

ABI (2013) also indicate that the overall liability of the pool will be limited. "Flood Re's aggregate annual liability collectively to insurers would be capped at a monetary level equivalent to a 1:200 year loss" which at current modelling and prices suggest an amount of £2.5 billion (c. NZ$ 4.7 billion) (ABI, 2013; 2). Above these losses the ABI want the UK Government to take primary responsibility who should work with Flood Re and the rest of the insurance industry to decide how to allocate available resources. However, from a negative perspective there appears to be no provision in the new system for directly encouraging the uptake of mitigation, nor limiting the access to the pool for those who suffer repeated claims. Newly built properties (those built after 2009) are excluded from receiving the premium cap and benefitting from the pool as well as any non-residential properties.

The full details of the proposal are still not completely available and there is of course uncertainty about how it will work in practice; there are many governance and administrative issues to consider and decide. There may also be some concern that it may not be possible to achieve all of the advantages of the new flood insurance scheme solely via the private market. Defra (2013a) argues that the draft Water Bill (UK Government, 2013) contains additional powers for the Secretary of State so that the government has the legal power to intervene if the proposal is unable to work as intended to ensure that flood risk remains universally available at an affordable price. Additionally, the Water Bill will legalise and ensure the levy is paid by all those participating in the home insurance market (ABI, 2013).

There are many elements of the insurance scheme still to be confirmed; not least the requirement for the system to gain State Aid approval from the EU.

This approval is required to ensure that the any new system does not distort the market and competition within the EU (European Commission website, 2012). It is thought that this new scheme will not be available for roll-out until summer 2015: in the interim the current Statement of Principles (ABI, 2008) will be maintained and extended (ABI, 2013).

The proposal includes some transitional arrangements and suggests that there will be a gradual rising of premiums and that the maximum cap will be increased year-on-year in the first instance so that households can adjust more easily to raising premiums: and may also take action to reduce their flood risk. Additionally, this is also considered to be an interim measure and is only intended to last for the next 20 to 25 years as mechanism to allow additional time for other choices to be made (Defra, 2013a) when the benefits for high flood risk households will be phased out (ABI, 2013) and a longer transition into what is likely to be a more risk-related system.

Key Characteristics: United Kingdom – System post-Summer 2015	
Insurance scheme:	Private insurance backed by an insurance-industry pool.
Types of perils and flooding covered by insurance:	Likely to be similar terms to the existing approach - All types of flooding are included within standard policies.
Optional/compulsory cover:	▪ Buildings insurance is compulsory with a mortgage loan. ▪ Contents cover is optional.
Insurance premium mechanism:	A formalised cross-subsidy at a flat-rate for all policies but reports indicate that across the board premiums should not significantly increase.
Risk transfer mechanism:	Bundled across risks and the presence of the flood pooling the higher risks and spreading across all household policyholders.
Penetration/ coverage of flood insurance:	Penetration should remain high as it will still be compulsory - however premiums will rise and therefore there may be many more people where affordability may be an issue.
Presence of state aid or compensation:	No.
Summary:	A private-system will remain but backed by an industry-run, not-for-profit pool
Key principles of the recovery system	
Efficiency:	It is unclear if mitigation will result – but if greater flood-risk reflective pricing results then there would certainly be the incentive. Newly built property (since 2009) is excluded.
Equity principle:	*Solidaristic, risk-insensitive* insurance – however through a formalised levy mechanism than previously. There is a move towards a *risk-sensitive* approach through the adoption of higher premiums and a greater reflection of risk in the pricing.
Robustness of recovery system:	*Medium* to *High* – in principle this system should be more robust than the current system as it permits the collection of a reserve pool to meet claims; thereby spreading the risk more widely between all policyholders (rather than just within companies as it was before). Additionally, there are greater ties between risk and premium value. However, it will be necessary to ensure that the levy and the cap are at the right level to ensure an appropriate balance between claims and premiums.

A2 The Americas

A2.1 Argentina

There is very low penetration of flood insurance in Argentina and in general insurance companies rarely provide flood insurance for properties. Where insurance is offered it is in the main by private insurance companies as an addition to fire insurance policies for domestic policies (and as a separate policy for commercial risks). Currently, there is very low market penetration and as cover for flooding is voluntary few households have purchased this product (S. Goytia, pers. comm.).There is high loss potential from flooding in the large cities (in particular in Buenos Aires) which could amount to several million US dollars. Gaschen et al. (1998) indicate that they believe that flooding is the most important natural hazard in Argentina and that as economic development increases in the country, so will the demand for flood insurance. It is however very difficult for insurance companies to accurately price flood products as data for risk assessment is deficient and therefore few insurance companies offer cover.

Similar to many other countries if there is evidence that damages were caused by some action or inaction by the state, then they would be liable to pay some compensation (S. Goytia, pers. comm.). However, it is unclear the extent to which this is undertaken in practice. In some locations some financial assistance is provided to residents to recover from flooding. For instance, in Buenos Aires the city council offers grants of up to a maximum of US$ 20 000 (c. NZ$ 24,720), tax exemptions and also more favourable lending rates (Buenos Aires Ciudad website, 2013). However, the regulations state that the taking of any assistance implies the resignation of any other legal action or claim against the city for the same flooding; a stipulation which has raised some criticism (S. Goytia, pers. comm.).

Key Characteristics: Argentina	
Insurance scheme:	Private insurance where available.
Types of perils and flooding covered by insurance:	Generally no flooding is covered.
Optional/compulsory cover:	Optional.
Insurance premium mechanism:	Unknown.
Risk transfer mechanism:	Where available is bundled and transferred between risks.
Penetration/ coverage of flood insurance:	Low.
Presence of state aid or compensation:	Some financial assistance appears to be available – however may come with conditions.
Summary:	Very little financial assistance available for recovery from flooding.
Key principles of the recovery system	
Efficiency:	Unknown.
Equity principle:	*Individualistic* in nature as insurance coverage is low and therefore people will have to rely upon themselves to recover.
Robustness of recovery system:	*Low* – low availability of insurance leads to concerns of anti-selection, but the conservative approach of the insurers may prevent this.

A2.2 Brazil

Brazil has a high loss potential from flooding which is likely to increase due to further economic development and climate change. Average annual economic losses in Brazil are in the order of US$ 1.4 billion (c. NZ$ 1.7 billion) with estimated damages of up to US$ 14 billion (c. NZ$ 17.3 billion) for a 1 in 100 year event (Sprissler, 2011). Sprissler (2011) goes on to estimate that 17% of the population (or 33.3 million people) are living in areas at risk of flooding.

Insurance is available in Brazil, provided via private companies and is flood automatically covered as part of a composite household buildings and contents insurance policy. However, flood damage from direct rainfall is excluded and all flooding is

excluded from single household contents policies (Gaschen et al., 1998). Reinsurance was monopolised by a State organisation the *Instituto de Resseguros do Brasil* however it was transformed into a joint-stock company although the majority shareholder remains the Brazilian government (Auffret, 2003).

However, despite the automatic cover for flood on many insurance policies penetration remains low and for the non-life sector (including natural perils) was only 3% (Sprissler, 2011). Providing a better functioning insurance market in Brazil would dramatically improve the situation for flood recovery as currently individuals and the government are required to finance reconstruction and bear the risk. One of the barriers to increasing penetration was the old reinsurance monopoly which limited cover to only a proportion of insurers' losses. The transformation of this system and the liberalisation of the reinsurance market have led to an increase in the options for reinsurance which it is hoped will mean that insurance in the residential sector will become more attractive.

However, the introduction of a reformed or new system in Brazil is compounded by the considerable contrast in socio-economic circumstances of those at significant risk. Different systems of insurance might need to be introduced to enable all at risk to be able to afford insurance. Sprissler (2011) argues that microinsurance schemes available for fire, explosion and lightning might also be extended to include flood insurance for homes and contents and might be available for 42 million households.

Key Characteristics: Brazil	
Insurance scheme:	Private insurance - Included within composite household policies.
Types of perils and flooding covered by insurance:	All flooding except direct rain water damage.
Optional/compulsory cover:	Optional.
Insurance premium mechanism:	No risk-reflected pricing.
Risk transfer mechanism:	Bundled and therefore subsidised across risks.
Penetration/ coverage of flood insurance:	Very low – due to low penetration of household insurance.
Presence of state aid or compensation:	Unknown.
Summary:	Purely market-driven system of optional household insurance.
Key principles of the recovery system	
Efficiency:	Unknown – but does not appear to include any incentives for mitigation.
Equity principle:	*Solidaristic risk-insensitive* – but solidaristic principle may be limited due to low penetration.
Robustness of recovery system:	*Low* – there is a high risk of anti-selection with low penetration of insurance – though the bundling offers some cross-risks transfer.

A2.3 Ecuador

Insurance is available in Ecuador via private companies and most fire policies also include coverage for natural perils including flood. However, for domestic properties insurance penetration is low and therefore there are few households with flood insurance. Where cover is taken out flood insurance is bundled with other risks and there is no separate premium calculated for flooding (Gaschen et al., 1998).

Key Characteristics: Ecuador	
Insurance scheme:	Private insurers via composite policy – linked to fire cover.
Types of perils and flooding covered by insurance:	Not clear – although likely flash floods and river floods included.
Optional/compulsory cover:	Optional.
Insurance premium mechanism:	No separate premium –bundled policies
Risk transfer mechanism:	Compound policy – between risks and across low risks.
Penetration/ coverage of flood insurance:	Very low.
Presence of state aid or compensation:	Unknown.
Summary:	Purely market-driven system of optional household insurance.
Key principles of the recovery system	
Efficiency:	Unknown – but does not appear to include any incentives for mitigation.
Equity principle:	*Solidaristic risk-insensitive* – but solidaristic principle may not actually occur due to low penetration.
Robustness of recovery system:	*Low* – there is a high risk of anti-selection with low penetration of insurance – although the bundling offers some cross-risks transfer.

A2.4 Mexico

Due to the high losses from previous events, the Mexican Government established the *Fondo de Disastres Naturales* (FONDEN) or a Natural Disaster Fund in 1996 to enable the better financing of losses. FONDEN was established as it facilities the management of budgetary resources as the Federal, State and local governments lacked an effective way of reinsuring and transferring the high risks being generated by natural hazards. The purpose of the FONDEN is to provide financial assistance to the State and Federal agencies who are required to prove that their budgets are insufficient to deal with the after-effects of natural disasters. Many natural perils are included within the FONDEN system including the damages from flooding and intense rainfall. In the main, the Disaster Fund is used to assist State governments and Federal Agencies in repair and reconstruction of assets such as motorways, schools, hospitals and other public assets with the FONDEN and State/municipal resources assuming different percentages of the recovery of assets. However, CCS (2008) does suggest that dwellings are one type of public infrastructure for which assistance can be sought at a ratio of 70% FONDEN resources and 30% State/Municipal resources. However, it is not clear exactly what is covered: whether all affected homeowners will receive aid to repair the properties, whether cover is included in all events and the precise conditions of insurance. GFDRR (2011b) suggests that this may be limited to the rehabilitation and reconstruction of low-income housing.

Despite suggesting that an advantage of FONDEN is to be able to supply aid to the population in times of event CCS (2008; 105) also reports that a weakness of the scheme is the long time it takes for the reconstructions of dwellings due to high legal regulation of the scheme and the "The absence of aid for the replacement of household effects for people who have lost the contents of their homes as a result of a natural disaster."

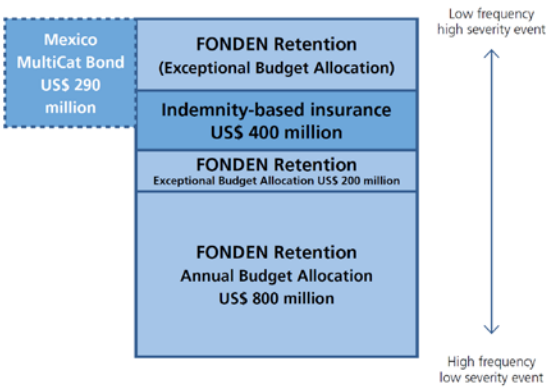
In 2006 a law was passed which aims to ensure that funds to not fall below a set value. The law ensures that the Ministry of Finance commits a fixed percentage of its annual budget to FONDON and that the total reserve (including monies committed coupled with uncommitted funds from previous years) should be not less than 0.4% of the annual Federal budget of approximately US$800 million (c. NZ$ 990 million) (GFDRR, 2011b).

There has also been movement towards protecting the assets in the FONDEN trust Fund through the use of insurance policies and in particular catastrophe bonds (cat-bond) to protect against the larger risks. In 2006, Cat-Mex was established and the Mexican Government purchased a parametric reinsurance contract of US$290 million (c. NZ$ 358 million) and a cat-bond of US$ 160 million (c. NZ$ 198 million) specific to earthquake perils. Multi-Cat Mexico was established in 2009

through the World Bank's MultiCat facility to extend coverage to include both earthquake and hurricane with a parametric cat-bond of US$ 290million (Lobato Osorio, 2012). Those risks below catastrophic status are reinsured via a separate scheme and the Mexican government are also beginning to take out insurance products to directly insure some public assets. This complex multi-level system of risk transfer (illustrated in Figure A1). There has also been movement towards protecting the assets in the FONDEN trust Fund through the use of insurance policies and in particular catastrophe bonds (cat-bond) to protect against the larger risks. In 2006, Cat-Mex was established and the Mexican Government purchased a parametric reinsurance contract of US$290 million (c. NZ$ 358 million) and a cat-bond of US$ 160 million (c. NZ$ 198 million) specific to earthquake perils. Multi-Cat Mexico was established in 2009 through the World Bank's MultiCat facility to extend coverage to include both earthquake and hurricane with a parametric cat-bond of US$ 290million (Lobato Osorio, 2012). Those risks below catastrophic status are reinsured via a separate scheme and the Mexican government are also beginning to take out insurance products to directly insure some public assets. This complex multi-level system of risk transfer (illustrated in
Figure A1) is enabling Mexico to become much more financially resilient to natural hazards.

However, there appears to be little movement on the availability and penetration of private household insurance products to enable individuals to take out their own cover. Paklina (2003) argues that penetration in Mexico is less than 5% and that availability is quite limited. Where insurance cover is available it is generally bundled with fire and earthquake coverage. Although there appears to be some scope for low income housing to receive recovery the degree to which others receive financial assistance through the FONDEN system is unclear.

Figure A1: FONDEN disaster risk financing strategy (as of 2011)



Source: GFDRR (2011b; 34)

Key Characteristics: Mexico	
Insurance scheme:	Limited private insurance is available. The FONDEN scheme has elements linked to the insurance and reinsurance market to create a fund to underpin recovery from disasters in Mexico.
Types of perils and flooding covered by insurance:	Both river flooding and heavy rain are included within FONDEN For private insurance – unknown.
Optional/compulsory cover:	Private insurance is optional.
Insurance premium mechanism:	For private insurance it is usually bundled with fire and earthquake – unclear how premiums are set.
Risk transfer mechanism:	Bundled and therefore subsidised across risks.
Penetration/ coverage of flood insurance	Penetration of private insurance cover is very low.
Presence of state aid or compensation:	There is the ability to provide relief in cases of natural catastrophes through FONDEN.
Summary:	FONDEN is an instrument for governments and state entities to quickly providing funds in response to natural disasters without compromising existing budgets.
Key principles of the recovery system	
Efficiency:	Not clear how much mitigation is incentivised through either private insurance or payments received through FONDEN. However, in conjunction with the FONDEN scheme there is an associated budget for ex ante protective risk management.
Equity principle:	The FONDEN scheme is funded through the national budget – *solidaristic* principles. For private insurance this is bundled and therefore also a degree of solidarity – although penetration is low and so the risk is not spread very widely.
Robustness of recovery system:	*Medium* – the FONDEN scheme has developed since its inception and the risks are being spread more widely and transferred to the reinsurance market. But recovery for ordinary households is arguably underdeveloped.

A2.5 Canada

Flood is considered to be the most frequent "significant disaster event" with 53 events being recorded by Public Safety Canada (2011) between 1900 and 2005 which is more than three times the next most common peril. Additionally, flood and flood-related windstorm damages account for high proportions of the insurance pay-outs in Canada (Sandink, 2011).

Within Canada the situation in relation to flooding and water is complicated with some water damages being insurable, whereas others are not included within traditional household policies. The precise definitions and exact coverage varies between policies in Canada, however Table A3 summarises those damages which are generally insurable and those for which no coverage is purchasable. This illustrates that the majority of coverable perils are those which are caused by the more man-made releases of water or those associated with other wind-related damages; in the most part flooding from overland sources such as fluvial or rainfall-based sources are not insurable.

The government in Canada have created programmes to financially-assist homeowners following flooding (Sandink et al., 2010). The responsibility for disaster assistance begins at the regional level and the Provincial and Territorial governments provide disaster recovery assistance programmes and make the decision about the level of disaster payments and when they should be provided. These regional systems are backed by the Federal Disaster Financial Assistance Arrangements (DFAA). This system is designed to provide some assistance and recompense to those Territories and Provinces which have sustained

significant damages. In the event that financial assistance is provided by the DFAA, the funds are provided directly to the regional government and it is their responsibility to reallocate these funds to individual households. The DFAA is designed to take effect when losses greater than CA$1 (c. NZ$ 1.2) per capita are experienced. Assistance then increases proportionally as the losses increase. Up to a maximum of 90% of losses being absorbed by the Federal Share when per capital losses are greater than CA$5 (Public Safety Canada, 2008).

This system however, is not protected by legislation and Sandink et al. (2010) describes it as an arrangement rather than a law; suggesting its use (and when and the terms of use) is discretionary rather than absolute. Furthermore, since 2008 the Federal government have also added a mitigation element to the DFAA to try to reduce repeated damages.

Table A3: Insurable water perils in Canada

Insurable water perils	**Water damages that are not insurable**
▪ Sudden and accidental escape of water from a water main ▪ Sudden and accidental escape of water or steam from a plumbing, heating, sprinkler, or air conditioning system ▪ Sudden and accidental escape of water from a domestic container located inside or outside a dwelling (except when the result of freezing) ▪ Water that enters a dwelling through an opening that has been created suddenly and accidentally by an insurable peril (e.g., a falling object like a wind-- blown tree) ▪ Sewer backup ▪ Sump-pump failure	▪ Overland flooding caused by - waves - tides - tidal waves - dam breaks - storm surges ▪ Flooding from any stream, river, or water body, natural or man--made ▪ Coastal flooding from lakes, oceans ▪ Tsunami ▪ Flooding from groundwater (except in Quebec) ▪ Overland flood waters or storm--water flows that enter the home through cracks in foundation walls or any opening above the surface of the ground.

Source: The Insurance Bureau of Canada model wordings –Sandink (2011; 12)

However, there is a desire in Canada to introduce flood insurance and different options have been explored (Sandink et al., 2010). They describe the provision of robust and extensive insurance cover as requiring a partnership between insurers and government. Their proposed solution would require governments (amongst other activities) to zone flood risk and undertake action to prevent new development in high risk areas; work to reduce flood risk to homeowners; increase public awareness of flooding and flood risk and alter the flood relief assistance procedures so as not to contradict with flood insurance. This final point is critical and financial assistance may in the future be prohibited for those households were insurance is available. In return, insurers would have the following role (Sandink et al., 2010; 59):

- Provide bundled flood coverage to all homeowners, aside from those occupying very high risk areas;
- Apply risk based insurance premiums or deductibles;
- Keep track of environmental and structural changes to watersheds and streams that have implications for the flood risk of their policy holders;
- Participate in flood risk communications with their policy holders, including possible damages and mitigation options;
- Ensure policy holders are aware of the characteristics of their insurance coverage, and ensure that policy holders are aware of changes in their coverage or premiums, and why their coverage may change over time, and;
- Monitor their accumulation of flood risk.

The exclusion of high-risk properties, the bundling of flood coverage with other perils and the risk-based premiums are all insurance mechanism which aims to ensure the robustness of the system and prevent over-exposure of the insurance industry. Financial assistance along with mechanisms for recuing risk will be critical in the high-risk flood areas where insurance would not be available. Despite potential options for the

introduction of flood insurance in Canada there has not need any movement towards this in recent years – maybe the recent severe flooding in Calgary in June 2013 will reopen the debate.

Key Characteristics: Canada	
Insurance scheme:	The limited flooding that is insurable is included within standard policies.
Types of perils and flooding covered by insurance:	▪ Only drainage or sewer related flooding is covered. ▪ There is no flood insurance for flooding from rainfall, river flooding, groundwater flooding or flooding from the sea.
Optional/compulsory cover:	n/a – as types of flooding is limited.
Insurance premium mechanism:	n/a – as types of flooding is limited.
Risk transfer mechanism:	n/a – as types of flooding is limited.
Penetration/ coverage of flood insurance:	n/a – as types of flooding is limited.
Presence of state aid or compensation:	Financial relief mechanisms provided by the National or State government.
Summary:	Generally, it is not possible to insure against flooding in Canada and therefore recovery in the most part is from National and regional financial assistance programmes – however it is an arrangement rather than a law and is considered to be discretionary.
Key principles of the recovery system	
Efficiency:	Little requirement on individuals to undertake mitigation or any aspects of risk reduction for the receipt of disaster-relief assistance.
Equity principle:	Most compensation is via the government adopting a *national solidaristic* approach.
Robustness of recovery system:	*Low* to *Medium* – Although spreading risks across a very large group (all taxpayers). However it does potentially expose the government to large losses and there is a desire to introduce a flood insurance system in order to better plan for losses and to spread the risks into the private market.

A2.6 United States of America

Flood insurance in the United States of America operates through the National Flood Insurance Program (NFIP) which was first implemented in 1968. The scheme is widely documented and has been extensively studied over a long period of time with the advantages, disadvantages and ultimately the overall effectiveness of the Program assessed (e.g. Platt, 1976; 1999; Arnell, 1985; Pasterick, 1998; FEMA, 2000). The NFIP comes directly from the US National government (although it is implemented at a state level) and in which the US Congress agreed to subsidise flood insurance for existing properties in flood-risk areas. Any new development was meant to have actuarial-based premiums. The guidance and policy of the scheme is very rigid and inflexible in nature and it can be argued that the approach is centralised, co-ordinated and controlling.

Communities' involvement in the NFIP is voluntary and operates on the basis that those who wish to obtain subsidised insurance need to commit to adopting appropriate mitigation measures (CCS, 2008). Risk maps are drawn to designate a risk zone - named Special Flood Hazard Areas (SFHAs) and communities are required to prevent or modify new construction so that it is protected from flooding below a certain magnitude: floods with an annual probability of 1% (1 in 100 year flood). In return for this, insurance premiums would be reduced and subsidised via the establishment of a community-rate. In 2010 the average premium was US$ 568 (c. NZ$ 702) and there were over 5.6 million policies written (FEMA, 2011).

Machetti (2009) argues that originally the premiums within the program were intended to be calculated actuarially, however the government ordered subsidies to encourage uptake and to

ensure affordability. There are two different types of subsidy. In the initial (or emergency) stage of the program before a community has been assessed, premiums are subsidised and calculated at a nationally-set level. Following the initial Flood Insurance Study and the creation of the Flood Insurance Rate map, subsidised premiums are calculated based on risk ratings for each individual community assessed by a range of variables including; the location, the age, the type of occupancy, the building and (for Special Flood Hazard Areas) the elevation (Machetti, 2009). Additionally, an individual property's insurance premium is also calculated as a percentage of the insured capital.

For those located in the designated SFHAs the decision to take out insurance is still voluntary and this has had a negative impact upon uptake with many of those at risk still remaining uninsured. Browne and Hoyt (2000) found that there was a positive relationship between insurance uptake and income and that affordability of premiums remains a real issue; despite the subsidies. Although flood insurance is not compulsory there are incentives for uptake as homeowners who have benefitted from Federal aid are required to take out cover to receive any assistance in the future and those who have federal mortgages are also mandated to take out cover. Whether to insure contents remains voluntary (CCS, 2008). Those areas with a flood risk lower than a 1% annual probability do not have to partake in the scheme (although some communities chose to participate) and purchasing insurance cover is not mandatory. Policies cover the real value of insured properties (the cost of replacement minus physical depreciation) or the cost of repair and replacement – whichever is the lower (CCS, 2008). A deductible also exists for both contents and buildings insurance.

Private insurers administer 95% of insurance policies established as part of the NFIP including; the selling and processing of policies, assessment and the payment of claims. Insurers are then able to submit their own claim against any losses occurred (i.e. premium funds minus claims) to the *National Flood Insurance Fund* in the US Treasury (CCS, 2008).

The National Flood Insurance Fund effective finances the NFIP using the premiums collected and monies from the Treasury. The original aim was to make the Program self-financing, however Congress also wanted to make insurance affordable and therefore the subsidies mean that this has not been achieved. Although NFIP is meant to replay any additional funding received from the US Treasury when it does not have sufficient funds, Abbott (2008) argues that the NFIP has never achieved full solvency and that it currently owes around US$ 17 billion (c. NZ$ 21 billion). This is one of the main criticisms of the system that is it not a viable mechanism for providing insurance, the main reason being relatively straightforward; the value of claims has always exceeded the amount of premiums collected.

There were other clear problems with the Program. Table A4provides statistics on repeated losses suffered by properties as part of the NFIP (reproduced from King, 2013; 21). FEMA (2011) also recognises this as a problem and lists that in 2010 over 80 000 properties are suffering repeated losses, with over 8000 of these are considered to be severe. The problem of repeated flooding is reinforced when you consider that 30% of all of the claims are attributable to 1% of insured properties (FEMA, 2011). Additionally, 25% of properties were rated at below actuarial rates, only 75% of properties complied with the mandatory nature of the insurance (i.e. those who have mortgages) and 50% of all of the damage occurred outside of the designated risk areas with only 1% penetration within these areas.

The high debt within the scheme, recognition that insurance is not effective in preventing development in areas of high flood risk and concerns about the cost of insurance under climate change conditions (Mills et al., 2005) have all contributed to calls for a reform of the NFIP.

Table A4: Total flood losses from the repeated flooding of properties in the NFIP: 1878 to 2011 (as of 31st December 2011: $nominal)

Building payments	$ 9, 332,087,006
Contents payments	$ 2,768,293,788
Total payments	$12,100,980,774
Average payment	$24,388
Number of losses	496,178
Number of properties	166,368

Data source: US Department of Homeland Security, FEMA

Source: King (2013; 21).

The Biggert-Waters Flood Insurance Reform Act 2012 (US Government, 2012) aims to resolve some of the perceived failings of the original approach. There have been many documents and commentaries that describe in detail the characteristics of the reforms (including NAIC/CIPR, 2012; EDEN, 2013; King, 2013).

Key changes to the scheme enshrined in the new legislation include (after King, 2013 and US Government, 2012):

- A reform of the premium rate structure – including:
  - The removal of the subsidy on premiums for second homes, homes sold to new owners, those properties which receive repetitive losses, any owners who have refused a FEMA mitigation offer and business properties
  - Raising the annual cap on premium increases from 10 to 20%
  - Increasing rates so that they are in line with average historical losses
  - Increasing the minimum annual deductible on properties.
  - Introducing more actuarial rates for properties which have been newly designated into special hazard areas.

- Increasing the privatisation of the scheme – in particular obliging FEMA to purchasing reinsurance on the global market to reduce the liability on the US national government.
- Accuracy of flood mapping and designation of Special Hazard Zones – this mainly includes provisions for improving mapping and mapping processes – including processes for settling wind- versus water-damage claims, for communities to request remapping and improving mapping data.

- Streamline processes for flood hazard mitigation and planning
  - Improve the efficiency of the NFIP this mainly involves improving the management of the - program and ensuring better compliance including;
  - Imposing penalties for non-compliance with the requirements of mandatory flood insurance (these will range between US$350 to US$2000 per violation (c. NZ$ 433 to NZ$ 2,472)
  - Better monitoring of contract and claims
  - Better data sharing between relevant organisations

- Repayment of NFIP debts and improving the overall solvency of the Program – including:
  - The creation of a US$ 12 billion (c. NZ$ 14.8 billion) reserve fund to spread losses better over time
  - Establishing a repayment schedule to the Treasury.

A timeframe for the implementation of the changes outlined in the new Act has been proposed (FEMA Website, 2013) this highlights a number of key dates whereby premiums are gradually increased over a period of up to five years. This is planned to increase premiums by 20% each year until premiums are at the full-actuarial rates.

The NFIP has clear links to mitigation measures which are of course fundamental to the offering of insurance and the subsidising of premiums. However, the effectiveness of this provision can be called into question with the numbers of repeated losses arguably indicative that the risk reduction mitigation component of the scheme is not functioning correctly. Mitigation becomes all the more important under the reforms of 2012 whereby the additional compliance clauses and penalties implemented provide an even greater incentive.

Although the Insurance Reform Act 2012 has been passed by the US government and the timeline for implementation has commenced, there is clearly still opposition to the reforms. In particular, a Flood Insurance Implementation Amendment Bill was introduced to Congress in early 2013 (US Government, 2013) which aims to further delay and phase in flood insurance premium rates for some properties and for some purposes.

Key Characteristics: United States of America	
Insurance scheme:	State-funded insurance scheme administered in the most part by private insurers.
Types of perils and flooding covered by insurance:	Quite comprehensive as the definition of flood is "an excess of water on land that is normally dry" and therefore for instance will cover heavy rain, fluvial and sewerage back-up as long as the back-up is caused by a flood.
Optional/compulsory cover:	Optional (but compulsory for those with federal mortgages and for those who receive federal aid who may need to receive it in the future)
Insurance premium mechanism:	There is an additional premium which is a percentage of the sum insured but there is some degree of risk-reflective pricing. But for areas in special risk zones that adopt mitigation these are (at least initially) subsidised.
Risk transfer mechanism:	Subsidised and backed by the state.
Penetration/ coverage of flood insurance:	Inside SFHAs the market penetration rate for single-family households is considered to be around 50% - but there is high variation across the US. Outside of risk areas only 1% penetration – although in terms of numbers approximately one third of policies are outside SFHAs.
Presence of state aid or compensation:	Federal aid - which for repeated assistance is subsequently tied to insurance.
Summary:	Recovery is both via Federal aid and a subsidised state-funded insurance scheme.
Key principles of the recovery system	
Efficiency:	Mitigation is a requirement and under the new act becomes even more important.
Equity principle:	*Solidaristic* both in terms of Federal aid, but also in terms of the current subsidies from the state – but moving towards a more individualistic risk-sensitive system.
Robustness of recovery system:	*Low* – In the old system the fund is not big enough to settle all the claims and clearly risk reduction is not completely effective as there are a large number of repeated claims. Robustness should increase under the new system as premiums increase and are more reflective of flood risk.

A3 Rest of the world

A3.1 Australia

Private insurance cover is available in Australia for a number of perils (including rain): however flood insurance for rivers and the sea had traditionally been excluded from insurance policies. There were nevertheless small pockets of flood insurance availability. For instance in West and South Australia flood cover has been a standard peril in household insurance policies and the Territory Insurance Office (TIO) has long offered flood cover in the Northern Territory (Mason, 2011). Despite these, coverage was not widespread and those households in areas with the highest potential exposure had little opportunity to purchase cover. CCS (2008) highlighted moves by the Insurance Council of Australia towards introducing separate flood insurance products for flash flooding and mainstream flooding and cover has slowly been increasing in recent years with insurers such as Suncorp, Zurich and NRMA beginning to offer products (Mason, 2011).

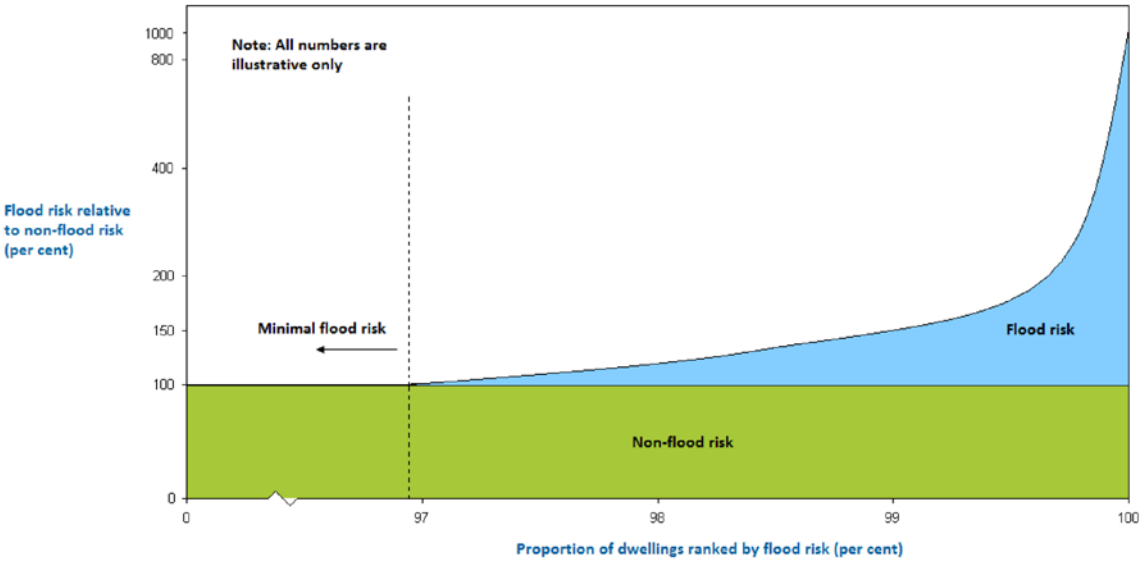
Insurance is provided via the private market and cover for rainfall-based or flash flooding was initially considered to be more successful – with a penetration rate of 60% (Paklina, 2003) - with many of the larger insurers including some limited cover on their household buildings and contents policies as well as motor insurance. Cover for mainstream flooding was initially more limited; however since 2006 it has been more widely available. This change was considered to be due to the better understanding of risk and an increased ability to identify properties at risk of flooding and in particular the introduction of the National Flood Information Database. Consequently, penetration of insurance is increasing with 75% of selected policies currently providing cover (ICA, pers. comm.). The ICA also indicated that they expected coverage to increase to over 90% in 2013 and that availability of insurance was no longer an issue; with only 7 to 8% of insurers not offering cover for flooding. It is important to note however, that this value relates to only policies sold and therefore only applies to that proportion of the population who have purchased household insurance.

Flood cover appears to be treated differently by different insurers and between products; some being available as part of a bundled household policy and others available as an additional extra product. This is situation can cause confusion for insurers. An additional premium appears to be charged for the flood component of the insurance (or for the additional component if it is a separate policy) to reflect the risk which can be considerable and may total an additional 45% of the policy cost for properties of the highest risk (CCS, 2008). The ICA (2011) also highlight that the failure of many owners of properties located in high risk areas to take out insurance for flooding is related to the affordability of the cover.

The high losses in the Queensland floods in 2010/2011 have reinforced the need to consider the introduction of a new standardised approach to flood insurance in Australia. A number of concerns and questions about insurance were raised in the Queensland Floods Commission of Inquiry (QFCI, 2012) and included that many policies did not cover flooding (or only partially covered it – e.g. storm and flash flooding was included but river was not), many homeowners were unaware that they were not covered and definitions of flooding were opaque and complicated. This may have been mostly addressed by the introduction of new legislation providing a clear definition of flooding.

In the aftermath of the floods three additional reviews were undertaken into the insurance situation; reviews by the Commonwealth Treasury (Commonwealth of Australia Treasury, 2011), the House of Representatives Standing Committee on Social Policy and Legal Affairs (Commonwealth of Australia, 2012) and perhaps most importantly the National Disaster Insurance Review (Commonwealth of Australia, 2011a; 2011b). The Insurance Review highlighted the problem of cover in Australia through an effective diagram (reproduced in Figure A2 below). This illustrates that there are a relatively small number of properties (1% of all properties or c. 50, 000) at high risk of flooding and a few more at moderate risk (3 to 6%). This causes problems in spreading cover sufficiently across at-risk properties and introducing risk-reflective premiums as it would be likely that insurance cover would largely become unaffordable for those at higher risk (the curve on the right). This means that it would be difficult to introduce a purely market-based flood insurance product; cover would almost certainly require either a subsidy or the introduction of a product where insurance is cross-subsidised across risks.

Figure A2: What is the flood insurance problem?



Source: Commonwealth of Australia (2011b; ii)

The Insurance Review describes two potential alternative models of insurance (Commonwealth of Australia, 2011b; iii):

- "that flood cover be provided automatically as part of home insurance, just as it provides cover automatically for bushfire and storm;
- or that flood cover be provided automatically but that homeowners be able to 'opt out' and have home insurance that includes cover for other causes of damage but not flood."

The first of these models would increase insurance penetration amongst homeowners; but without some level of assistance many of those in high risk areas will struggle to afford increased premiums. The second model would lead to an increase in coverage but market penetration will still be limited. Both of these models would require the identification of high-risk properties and the establishment of thresholds (whether risk-based or price-based) above which properties would receive assistance (via a subsidy or discount) to purchase insurance. These subsidies or discounts would need to be managed and covered by some kind of central pool or similar. In total there were 47 recommendations from the Review with the following five being identified as most significant (Commonwealth of Australia, 2011a; 11):

- All home insurance, home contents insurance and body corporate insurance products need to include flood cover.
- Discounted insurance premiums are needed for homes, home contents and home units in areas of medium and high flood risk, so as to render flood insurance affordable.
- National coordination of flood risk measurement and mitigation is needed, in order to improve flood risk management for the benefit of the community generally and to ensure the continuing development of a competitive market for flood insurance.
- A mechanism is needed to fund the discounts that are to be offered for affordability purposes.
- Insurers will need access to a government-sponsored reinsurance facility if they are to deliver flood insurance discounts without compromising their own commercial positions.

The Australian Government has responded to the Insurance Review. They agreed that they do not intend to make flood insurance for building and contents compulsory for all households, suggested that some of the recommendations have significant budgetary implications and in the most part greater consultation with stakeholders and understanding of the implications of the recommendations is needed. The ICA (2011) also responded to the review and do not consider the introduction of a pool to be the best or most viable option. They consider that the private market in

itself is not failing, however that the government needs to intervene to improve the mitigation in high flood risk areas and thereby reduce the risk of those properties being flooded. In the meantime they suggest that the government should subsidise the premiums of the highest risk householders (thereby making insurance affordable) whilst mitigation is being constructed (ICA, 2011). Although penetration has clearly increased, flood insurance is still not mandatory and individual households retain the ability to choose not to purchase cover for flooding. Penetration in high risk flood areas is consequently still quite low.

The principal Commonwealth funding mechanism for State disaster relief is the Natural Disaster Relief Arrangements (NDRA). This formal structure has been in place since the late 1970s and its purpose is to; "reduce the excessive financial burden on the States caused by the effects of natural disasters" Australian National Audit Office (2000; 73). Many different types of assistance are available, many being provided through the social security system and cover those who are out of employment due to the consequences of a disaster. The Australian Government Disaster Recovery Payments (AGDRP) are provided in only the most serious of disasters and are a one-off, means-tested payment for individuals (AUS$1000 for adults and AUS$400 for children (c. NZ$ 1,195 and NZ$ 478)) (Commonwealth of Australia website, 2011) which although will assist with emergency costs, they payments are not intended to be significant contributions to recovery.

The Queensland floods in 2010/11 also saw a strong and positive response by the Australian Federal Government to recovery and reconstruction with the creation of the Queensland Reconstruction Authority (QldRA) by Act of Parliament to co-ordinate and manage the recovery and reconstruction of areas affected by flooding. Furthermore, the Australian Government also introduced a "flood levy" for 2011-12 through two pieces of legislation; the Tax Laws Amendment (Temporary Flood and Cyclone Reconstruction Levy) Act 2011 (Commonwealth of Australia, 2011c) and Income Tax Rates Amendment (Temporary Flood Reconstruction Levy) Act 2011 (Commonwealth of Australia, 2011d). Both of these Acts were passed to raise funds by imposing a levy on higher rate tax-payers for recovering from the floods. The Australian Treasury estimated that this would raise AUS$ 1.7 billion (Australian Government Treasury website, Accessed May 2012).

The disaster payments do provide State and Local Authorities with some recompense for action taken immediately following flooding events; however little was directly passed on to individuals for recovery. Despite their being both State and Federal compensation, recovery from flood losses still fall heavily upon the victims of flooding to bear the risk.

The historical lack of flood insurance in higher-risk areas, and in turn recompense for losses sustained during flooding, have meant that individuals are considering introducing flood resistance and flood resilience measures at their own expense. In effect, this is paying out a sum in the present in order to reduce the total losses sustained in the future. This action has been supported by many local councils in Australia, who have initiated schemes whereby homeowners are provided with a proportion of the funding for these measures or given access to loans for these types of action. Similarly, the lack of recompense for flood losses also means that homeowners are willing to consider more extreme measures such as voluntary purchase and house-raising. However, as the Queensland floods in 2010 demonstrated for the larger events some of the individual property-level measures implemented may not be effective. Additionally, any new insurance cover may alter the balance in householder responsibility for mitigation

Key Characteristics: Australia	
Insurance scheme:	Flood insurance is available via the private market and is available as either a component of household policies or as an additional insurance product.
Types of perils and flooding covered by insurance:	Varies between policies – but the new legislation about the definition of flood may standardise this.
Optional/compulsory cover:	Optional cover.
Insurance premium mechanism:	An additional premium is charged for flood insurance related to risk.
Risk transfer mechanism:	Actuarial premiums are charged to spread the risk - also via reinsurance.
Penetration/ coverage of flood insurance:	Up to 84% of policies selected by households purchasing insurance have coverage. But this % only relates to those who have purchased insurance.
Presence of state aid or compensation:	Some disaster assistance is available although this appears to be limited.
Summary:	Insurance primarily available via the private market with some limited other assistance available in very hardship cases by the government.
Key principles of the recovery system	
Efficiency:	The premiums charged are risk-reflective therefore this might provide some incentives for mitigation – but it is not clear whether there would be a premium decrease for properties which undertake individual measures.
Equity principle:	There is some degree of solidarity if insurance is offered as part of a composite policy. However, due to the premium differentiation in the most part the insurance is *individualist* and *risk-sensitive.*
Robustness of recovery system:	*Medium* – the increasing penetration and risk-reflective premiums of flood insurance spreads the risk further and makes the insurance system more economically viable. However, from the point of view of the recovery system, the failure of those in high risk areas to purchase flood insurance leaves a large number of properties exposed to flood risk without an adequate mechanism for recovery.

A3.2 China

China has a huge loss potential for flooding and economic losses can run to many billions of US dollars. Flood cover is available and similar to many other countries it is included as part of a standard fire policy (Gaschen et al., 1998). However, insurance penetration is low as policies are often only taken out in urban locations. Gaschen et al. (1998) argue that as affluence increases the demand for insurance may also increase, but this is likely to remain to be concentrated in urban areas.

Surminski (2013) argues that catastrophe insurance coverage for natural perils is limited for individuals and that coverage for the property market is underdeveloped. Wang (2012) suggests that for private properties only one out of every hundred dwellings has insurance against natural perils. Penetration for cover relating to floods, earthquakes and typhoons for properties was estimated to be in the order of 5% in 2008 (Swiss Re, 2008 cited in Surminski, 2013). Part of the issue is thought to relate to the general underdevelopment in the domestic private insurance market due to the fact that historically in China private-property ownership was limited (Surminski, 2013). Both private market solutions as well as regulatory solutions are being investigated; although earthquake risks are initially the highest priority for insurance coverage.

Wang (2012) provides a proposal for the Chinese government to step in to stimulate the growth and availability of catastrophe insurance. A pool system is recommended whereby the government would either provide direct insurance or reinsurance for natural perils. However, they suggest that the nature of flooding (including the "scope for immediate post-disaster mitigation action and use of soft loans") would mean that it would require a separate arrangement although this might be administered within the same system (Wang, 2012; 2).

Key Characteristics: China	
Insurance scheme:	Private and state owned insurers via composite policy; linked to fire cover.
Types of perils and flooding covered by insurance:	Not clear.
Optional/compulsory cover:	Optional.
Insurance premium mechanism:	Actuarial.
Risk transfer mechanism:	Compound policy – between risks and across low risks. Risk may also be transferred to the government in the case of public insurance and to reinsurance via the private market.
Penetration/ coverage of flood insurance:	Low, (c. 5%) with a higher penetration in urban areas.
Presence of state aid or compensation:	Unknown.
Summary:	Very limited insurance cover available via the private market.
Key principles of the recovery system	
Efficiency:	Unknown
Equity principle:	Individualistic risk-sensitive insurance – although most recovery is likely to come from the state and therefore solidaristic in nature.
Robustness of recovery system:	Low – very limited cover and potential for anti-selection.

A3.3 Indonesia

Indonesia is at risk from a range of different flooding mechanisms and frequently suffers from fluvial and flash flooding and well as storm surges. Flood insurance is offered by both provide and state-owned insurers and where available is part of fire policies with an additional tariff (but not differentiated by risk). Both contents and buildings are covered under the same terms and conditions. However, penetration of insurance remains low with approximately 20% of fire policies having additional cover for flooding (Gaschen et al., 1998). Flood insurance is not really economically efficient in Indonesia because premiums are not reflective of the risks and "not differentiated by the degree of the hazard" (Gaschen et al., 1998; 19).

Key Characteristics: Indonesia	
Insurance scheme:	Insurance offered by both state and private insurers: added to fire policies.
Types of perils and flooding covered by insurance:	Unknown.
Optional/compulsory cover:	Optional.
Insurance premium mechanism:	An additional premium tariff is charged but this is not differentiated by flood risk.
Risk transfer mechanism:	Risks are transferred between different areas of flood risk – but this is not very widely. Also it is spread by reinsurance if necessary.
Penetration/ coverage of flood insurance:	Low (c. 20%).
Presence of state aid or compensation:	Unknown.
Summary:	Recovery is primarily via insurance.
Key principles of the recovery system	
Efficiency:	Unknown.
Equity principle:	*Solidaristic risk-insensitive* insurance – but the solidarity pool is quite limited due to the low penetration of cover.
Robustness of recovery system:	*Low* – considered to be economically inefficient as it premiums are not flood-risk reflective. Also only 20% of fire policies actually offer flood cover.

A3.4 Israel

Israel suffers from a number of different types of flooding with the most severe damages being caused by fluvial and flash flooding due to intense rainfall, in particular in urban areas. Flood insurance is available in Israel solely through the private market; the government has no involvement in natural hazards insurance. Optional flood insurance is available as a supplement to fire policies on domestic properties for an additional premium (Gaschen et al., 1998). A deductible of a minimum of US$100 (c. NZ$ 124) is applied to each claim. Gaschen et al. (1998) report than penetration for flood insurance is very high (c. 95%). This may be for two main reasons; firstly until 1992 natural perils cover was included automatically and therefore there is a tradition of coverage and secondly a policy is a condition of having a mortgage. The bundling of flooding with other perils works to spread the risk across the different natural hazards and therefore works counter to anti-selection (Gaschen et al., 1998)

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Key Characteristics: Israel	
Insurance scheme:	A bundled natural perils policy purchased as an add-on to fire policies.
Types of perils and flooding covered by insurance:	Flood, storm and rainfall covered.
Optional/compulsory cover:	Optional – but required with a mortgage.
Insurance premium mechanism:	An additional premium required – but not flood-risk related.
Risk transfer mechanism:	Spread across different risks (cross-subsidised). Also has reinsurance.
Penetration/ coverage of flood insurance:	Very high (c. 95%).
Presence of state aid or compensation:	No government involvement.
Summary:	Recovery from flooding is entirely based upon private flood insurance.
Key principles of the recovery system	
Efficiency:	Unknown.
Equity principle:	*Solidaristic, risk-insensitive* insurance.
Robustness of recovery system:	*Medium* – Very high penetration and presence of reinsurance spreads the risks widely. It is unlikely that the economic viability of the insurance industry would be threatened by flooding. If losses rise premiums may also have to increase.

A3.5 Japan

Japan is one of the most exposed countries to natural hazards and with large urban populations and economic assets; the potential for damages is very high. In Japan, flood cover is excluded from simple fire policies; however within comprehensive fire policies an additional multi-risk policy can be added which includes cover for water damages sustained from typhoons, intense rainfall and other overflows (CCS, 2008). There is a medium degree of market penetration for this flood insurance in Japan. Paklina (2003) suggested than in 2003, 49% of households had fire policies for buildings insurance and 35% had fire policies for household contents; both of which include cover for flooding. An additional premium is chargeable which is calculated as a percentage of the capital insured but although when earthquakes are covered there is some differentiation according to the building construction type and location, with flooding there is no differentiation owing to risk (Machetti, 2009)

Additionally, not all losses are indemnified by the cover. Flood cover is offered on a partly co-insurance basis with the householder required to themselves recover from some of the losses. There are the usual deductibles associated with a policy; but in Japan these are quite high at 30% of the claim. In addition to the deductible, there is a level of co-insurance present and a policyholder is only indemnified up to 70% of the losses if the claim is greater than 30% of the insured value (Gaschen et al., 1998).

Key Characteristics: Japan	
Insurance scheme:	Sold by the private insurance market as part of a comprehensive fire policy.
Types of perils and flooding covered by insurance:	All flood risks are covered resulting from typhoon, storm surge, fluvial etc.
Optional/compulsory cover:	Optional.
Insurance premium mechanism:	An additional premium is required calculated as a percentage of the total sum insured – but is not tied to flood risk.
Risk transfer mechanism:	To some degree it will be spread across risks; however the optional nature means that it is likely only to be purchased by those at risk. Some transfer of risk via co-insurance and reinsurance.
Penetration/ coverage of flood insurance:	Medium penetration of c. 40% for domestic properties.
Presence of state aid or compensation:	Unknown.
Summary:	Recovery is primarily through private market insurance with a co-insurance element which means that those insured retain a higher than usual element of the risk.
Key principles of the recovery system	
Efficiency:	The co-insurance element and the limiting on indemnification is an incentive to reduce losses and therefore to take some mitigation activities.
Equity principle:	There is partly a *solidaristic* element (via the spreading amongst different risks) but it also firmly has an individualistic element via co-insurance.
Robustness of recovery system:	*Low* to *Medium* -The medium penetration rate leaves the scheme open to anti-selection which threatens the economic viability of the scheme.

A3.6 Philippines

There is no government involvement in flood insurance solutions in the Philippines; insurance is only available through the private market. Insurance cover for flood damages is available as an addition to typhoon policies (which are sold coupled to fire policies) for an additional premium. The premium is partly risk-related as properties are divided into six different hazard zones with an additional premium ranging from 0.1 to 0.6‰ of the insured value (Gaschen et al., 1998). But these ratings are linked to the typhoon risk and therefore are not risk based for all types of flooding. Furthermore, deductibles are also applied to claims amounting to approximately 2% of the value. There is a low market penetration of insurance with only 10 to 20% of fire policies having a flood and typhoon component (Gaschen et al., 1998). There is a high potential for adverse selection as there are few mechanisms for transferring the risk as full flood-risk related premiums are not charged and it is likely that only those at higher risk will purchase cover. Insurers are therefore weary about offering cover due to their concern about their exposure. Insurers are in the most part able to protect themselves by purchasing reinsurance on the global reinsurance market.

Key Characteristics: Philippines	
Insurance scheme:	An additional policy purchased alongside typhoon insurance as an add-on to fire policies.
Types of perils and flooding covered by insurance:	Not clearly defined.
Optional/compulsory cover:	Optional.
Insurance premium mechanism:	Additional premium – partly risk-based but on typhoon risk and therefore not completely tied to flood risk.
Risk transfer mechanism:	No real clear mechanism – and likely only to be purchased by those at risk. Only spread by reinsurance.
Penetration/ coverage of flood insurance:	Low (c. 10 to 20%).
Presence of state aid or compensation:	No compensation.
Summary:	Entirely private system of insurance which partial risk-sensitive
Key principles of the recovery system	
Efficiency:	Appears to be little incentives for mitigation – as premiums not tied to flood risk.
Equity principle:	*Individualistic* - Partly *risk-sensitive* insurance.
Robustness of recovery system:	*Low* – high potential for anti-selection as low penetration and the risks are not spread widely.

A3.7 South Africa

Gaschen et al. (1998) report that private flood insurance is only available in South Africa and that there is no state compensation for flooding or other natural perils. Property owners are able to purchase flood insurance as a supplement to their household fire policies. These policies do not have risk-reflective premiums for flood insurance and deductibles or co-insurance are used rarely (Gaschen et al., 1998). However, there should be a market tariff for storm losses – in which flood is included – but this is not always adhered to. Cover is unavailable in some of the high risk areas which have been repeatedly flooded. It is suggested that although penetration in terms of the number of households covered for fire (and therefore in the most part also flooding) is low at 30 to 50%; in terms of the value in 1998 over 75% of the value of real estate is covered.

Key Characteristics: South Africa	
Insurance scheme:	Private insurance as an add-on to fire policies.
Types of perils and flooding covered by insurance:	Unknown – definitely flooding tied to storm events.
Optional/compulsory cover:	Optional.
Insurance premium mechanism:	There is a national market tariff for flooding related to storm but this is not always adhered to.
Risk transfer mechanism:	Not really clear if it is bundled with other perils – spread probably only by reinsurance.
Penetration/ coverage of flood insurance:	Medium to low penetration < 50%, but in 1998 three-quarters of assets were covered
Presence of state aid or compensation:	No state compensation.
Summary:	A completely private insurance system – not completely free-market based as there are market tariffs in place for this insurance.
Key principles of the recovery system	
Efficiency:	Coverage is unavailable in high risk areas which limits exposure of the insurers and may encourage some mitigation – but this is unlikely.
Equity principle:	*Individualistic, Risk-insensitive* insurance.
Robustness of recovery system:	*Low* to *Medium* - The worst anti-selection may be avoided as high risk areas are excluded. But little spreading of the risks and therefore the economic viability of the scheme may be exposed.

A3.8 Taiwan

Since 2001 any flooding caused by earthquakes (such as tidal wave, surge or other floods) is covered as part of the National Residential Earthquake Insurance Program (CCS, 2008). This makes insurance for earthquakes (and earthquake-related perils) compulsory as part of fire policies backed by a central private reinsurance pool. It was enacted by the *Insurance Law Amendment Act* which was in force since July 2001 and is based on the Taiwan Residential Earthquake Insurance Fund (TREIF) and applies a unified annual flat-rate premium of NT$ 1,459 per policy (c. NZ$ 62) as of 2013 (TREIF website, 2013). Damages are insured for their replacement value and the maximum level of insurance is NT$1,200,000 (c. NZ$ 50,800) and when added to those living expenses which are able to be claimed the total claim per household is NT$1.38 million (c. NZ$ 58,400) (TREIF website, 2013).

There is a multi-level reinsurance structure whereby some of the losses are transferred to a co-insurance pool, some to the government and some risks to third parties such as the local and global reinsurance market as well as capital markets (Machetti, 2009). Gurenko et al. (2006) describe this scheme as a government-sponsored catastrophe insurance program.

However, this insurance only appears to cover losses from flooding related to earthquakes. Gaschen et al. (1998) reports that in Taiwan flood insurance related to typhoon-related storm events was also available through the private market. Cover was provided as an endorsement to household fire insurance policies although uptake was very low with a penetration rate in 1998 of less than 1% (Gaschen et al., 1998). The state was considered to have high control of the product In terms of both premiums and the design of the scheme. Gaschen et al. (1998) highlighted that penetration is low for two reasons; because premiums are high and fluctuate relative to flood risk and low flood and product awareness. Additionally, anti-selection is also considered to be a major issue.

Key Characteristics: Taiwan		
Insurance scheme:	Private insurance for typhoon-related flooding	National Residential Earthquake Insurance Program includes some flood elements.
Types of perils and flooding covered by insurance:	Limited to typhoon-related flooding.	Earthquake-related flood risks.
Optional/compulsory cover:	Optional endorsement to fire policies	Compulsory on all fire policies.
Insurance premium mechanism:	Premiums for the additional component are risk-reflective.	A flat-rate additional premium is added.
Risk transfer mechanism:	Premiums are risk-reflective – and also via reinsurance.	Some across risks – but largely by transferring it to a co-insurance pool.
Penetration/ coverage of flood insurance:	Very low penetration.	Unknown – although the compulsory element should make it relatively high.
Presence of state aid or compensation:	Unknown.	
Summary:	Compulsory insurance on fire policies backed by a co-insurance pool which is spread further by a number of financial mechanisms for earthquake related risks.	
Key principles of the recovery system		
Efficiency:	Unclear – but it appears both systems are not to be tied to mitigation activities.	The co-insurance part of the system should provide some incentives for mitigation.
Equity principle:	*Individualistic risk-sensitive* insurance system	*National solidaristic* approach – affords a minimal protection to everyone.
Robustness of recovery system:	*Low* - High potential for anti-selection as low penetration.	*Medium* – Risks are spread quite widely which should provide some economic viability. The compulsory nature broadens the pool.

Appendix B: Exchange rates into New Zealand dollars

Local currency information was translated into NZ dollars as per the exchange rate on the 1st June 2013 – using the exchange rates in the table below.

Currency	NZ$1 equivalent
Australian dollar (AUS$)	0.8367
Brazilian real (BRL)	1.7053
Canadian dollar (CA$)	0.8335
Swiss Francs (CHF)	0.7716
Danish krone (DKK)	4.6231
Euro (€)	0.6203
British Pound (GBP)	0.5313
Norwegian krone (NOK)	4.7156
New Taiwan dollar (NT$)	23.6278
Turkish lira (NTL)	1.5142
Swedish krona (SEK)	5.3127
United States dollar(US$)	0.8091

Taken from the Yahoo finance currency convertor www.finance.yahoo.com/currency-converter/

Appendix C: Glossary of insurance terms

This glossary provides some basic definitions and focuses primarily on insurance terms. Where terms have been defined in literature the courses are provided.

‰	Per every thousand.
Actuarial premium	The price that would cover the expected claims cost determined using sound actuarial principles along with a margin for expenses and profit. An actuarially derived premium is one which is based on the expected cost of claims, taking into account the severity and likelihood of an event. Commonwealth of Australia (2011a; 142 and 144)
All risks	"A property insurance which covers any accidental loss or damage that is not specifically excluded under the policy" Lloyd's website (2013)
Anti-selection (or adverse-selection)	Also referred to as adverse-selection or negative-selection A hazard to the robustness of an insurance system. "Insurance coverage is mostly requested by people in flood-prone areas who are frequently affected by floods, whereas people in low or residual risk areas are not interested in flood insurance coverage. Thus, the basic principle of pooling of risks is violated" Thieken et al., (2006; 384)
Catastrophe reinsurance	"A form of reinsurance that indemnifies the ceding company for the accumulation of losses in excess of a stipulated sum arising from a single catastrophic event or series of events." IRMI website (2013)
Claim - this is also referred to as a Loss.	"Injury or loss to the insured arising so as to cause liability to the insurer under a policy it has issued." British Insurance Brokers' Association website (2013)
Co-insurance	"In property insurance, requires the policyholder to carry insurance equal to a specified percentage of the value of property to receive full payment on a loss." AM Best website (2013)
Condition of average	A potential condition on an insurance policy which takes account of the difference between the sum insured and the actual current value of a property (i.e. the degree of underinsurance). In situations where this clause exists, when partial loss occurs the pay-out received through the insurance policy will be adjusted (pro-rata) to the same proportion as the value of the underinsurance.
Contents insurance	This refers to the coverage that is available for the personal belongings and fixtures and fittings of a property.
Correlated Risk	Correlated risk refers to the simultaneous occurrence of many losses from a single event… natural disasters such as earthquakes, floods, and hurricanes produce highly correlated losses: many homes in the affected area are damaged and destroyed by a single event. Kunreuther (2007; 6)
Cover	"(1) A contract of insurance. (2) To effect insurance. (3) To include within the coverage of a contract of insurance." IRMI website (2013)
Coverage	"The scope of protection provided under an insurance policy. In property insurance, coverage lists perils insured against, properties covered, locations covered, individuals insured, and the limits of indemnification." AM Best website (2013)
Deductible Or excess	"the deductible is that portion of the loss that policyholders have to bear themselves" Hausmann et al. (2012; 7)

These are often used interchangeably and also some claim a technical difference they are practical terms similar.	"The specified amount a loss must exceed before a claim is payable. Only the amount which is in excess of the deductible is recoverable." British Insurance Brokers' Association website (2013) "The first portion of a loss or claim which is borne by the insured. An excess can be either voluntary to obtain premium benefit or imposed for underwriting reasons." British Insurance Brokers' Association website (2013) "In the context of an insurance policy, an excess is the amount for which a policyholder is liable in the event of a claim." Commonwealth of Australia (2011a; 142)
Direct material damages	This refers to the actual damages to a property, land or contents, rather than other losses such as business interruption or loss of income.
Efficiency	For the purposes of this report when efficiency is referred to in relation to whether an insurance or recovery system's is designed to provide incentives for flood mitigation and its effectiveness in doing so. Based on IIASA (1999, p3).
Endorsement	"An insurance policy form that either changes or adds to the provisions included in one or more other forms used to construct the policy, such as the declarations page or the coverage form." IRMI website (2013) A document that is attached to a slip, cover note or policy which evidences one or more changes in the terms of the insurance or reinsurance contract to which it refers. Lloyd's website (2013)
Excess	See deductible
Exposure	"Measure of vulnerability to loss, usually expressed in dollars or units." AM Best website (2013)
First-loss policy	"A type of property insurance policy that provides only partial insurance. In the event of a claim, the policyholder agrees to accept an amount less than the full value of damaged, destroyed or stolen items/property. In return, the insurer agrees to not penalize the policyholder for under-insuring their goods or property….In a first-loss policy claim event, the policyholder does not seek compensation for losses below the first-loss level. Premiums are calculated proportionately - meaning they are not based on the full value of total goods or property." Investopedia website (2013)
Flat-rate premium	A premium which is offered at the same rate for all those insured, i.e. there is no differentiation according to risk.
General insurance	All non-life insurance policies including household policies and motor insurance policies
Guarantee	In this report refers to the assurance by a private or public organisation to assume responsibility for the loss (or part of a loss) if one or more of the insurers or other organisations default on their responsibilities. A guarantee may be limited or unlimited in nature.
Indemnity	"A principle whereby the insurer seeks to place the insured in the same position after a loss as he occupied immediately before the loss (as far as possible)." British Insurance Brokers' Association website (2013) "Restoration to the victim of a loss by payment, repair or replacement." AM Best website (2013)

Indemnity value	The value of the above.
Insurability	"Acceptability to the insurer of an applicant for insurance at a given rate." IRMI website (2013)
Insurable value	"The value of the insurable interest which the insured has in the insured occurrence or event. It is the amount to be paid out by the insurer (assuming full insurance) in the event of total loss or destruction of the item insured." British Insurance Brokers' Association website (2013)
Insurant	Someone who takes out an insurance policy (i.e. those who are insured)
Limit	"The insurer's maximum liability under an insurance, which may be expressed 'per accident', 'per event', 'per occurrence', 'per annum', etc." British Insurance Brokers' Association website (2013)
Loss-ratio	A measure of an insurer's financial performance, calculated by dividing total claims cost over the period by total premiums over the period. Commonwealth of Australia (2011a; 143)
Market solvency	"Having sufficient assets--capital, surplus, reserves--and being able to satisfy financial requirements--investments, annual reports, examinations--to be eligible to transact insurance business and meet liabilities." AM Best website (2013)
Mitigation	Mitigation refers to the elimination or reduction in the frequency, magnitude, or severity of exposure to risks, and associated losses. Commonwealth of Australia (2011a; 143)
Moral hazard	"Insured individuals may behave less carefully when they have insurance coverage, while this is unobservable by the insurer." Botzen and van den Bergh (2008; 419-420) For instance, homeowners may not try to save property out of the way of flood waters as they realise that they will be able to claim for losses. Deductibles and upper limits on insurance coverage are usual ways of tackling moral hazard.
New for Old	"Where insurers agree to pay the cost of property lost or destroyed without deduction for depreciation." British Insurance Brokers' Association website (2013)
Parametric insurance (reinsurance)	Insurance or reinsurance that does not provide cover for the total loss. Instead this cover will pay out based on a prior agreement of a value following the occurrence of a flood or other natural peril. This is most viable for high intensity but low frequency events and avoids the necessity for post-event damage assessment.
Peril	"A contingency, of fortuitous happening, which may be covered or excluded by a policy of insurance." British Insurance Brokers' Association website (2013)
Personal lines	"Insurance which is sold to individual consumers such as buildings, contents and travel insurance. This term is used in contrast to commercial lines." Lloyd's website (2013)
Policy	"A document detailing the terms and conditions applicable to an insurance contract and constituting legal evidence of the agreement to insure. It is issued by an insurer or his representative for the first period of risk. On renewal a new policy may well not be issued although the same conditions would apply, and the current wording would be evidence by the renewal receipt." British Insurance Brokers' Association website (2013)
Policyholder	A person who holds an insurance policy and by it contracts with an insurer for coverage against specified events. QFCI (2012; 651)
Premium	A premium is the amount charged by an insurer to the policyholder enabling them to cover an agreed risk. It includes the expected cost of claims;

	administration processes and insurer profit, and usually includes taxes and levies. Commonwealth of Australia (2011a; 144)
Private insurer	A private insurer refers to an insurance company, rather than a state or government- owned or controlled insurer. After QFCI (2012)
Property insurance	The cover that is available for losses or damage to the property or building. Also known as structural insurance.
Reinstatement	"Making good. Where insured property is damaged, it is usual for settlement to be effected through the payment of a sum of money, but a policy may give either the insured or insurer the option to restore or rebuild instead." British Insurance Brokers' Association website (2013)
Reinsurance	Reinsurance is insurance purchased by insurers and is used as a way to transfer risk from the insurer to the reinsurer. Commonwealth of Australia (2011a; 145)
Replacement value	As new replacement. Replacement value cover provides for the full reinstatement of a damaged home to its original size and standard regardless of depreciation or age and in accordance with prevailing building standards. Replacement value cover usually includes the removal of debris and re-building fees in the event of a total loss claim. Commonwealth of Australia (2011a; 145)
Reserve	"An amount representing actual or potential liabilities kept by an insurer to cover debts to policyholders. A reserve is usually treated as a liability." AM Best website (2013) A statutory reserve is one that is required by law whereas a voluntary reserve is one that an insurer may choose to allocate surplus to strengthen their financial structure.
Risk-related premium	Risk-related premiums have some degree of price modulation in accordance with the exposure (risk level) to some extent.
Stop Loss	"Any provision in a policy designed to cut off an insurer's losses at a given point." IRMI website (2013)
Sub-limit	A sub-limit in an insurance policy refers to the maximum amount of cover applied to a particular section of the policy. Commonwealth of Australia (2011a; 145)
Sum insured	A sum insured refers to the amount of cover, expressed in dollars, that is provided by an insurance policy. It is the maximum amount payable on each claim under the policy. Commonwealth of Australia (2011a; 146)
Supplement	See endorsement
Technically-priced premiums	See full actuarial premiums.
Total loss	"Where the subject matter of an insurance is lost, destroyed or damaged beyond repair." Lloyd's website (2013)